

Aviation Week

Including Space Technology

75 Cents

A McGraw-Hill Publication

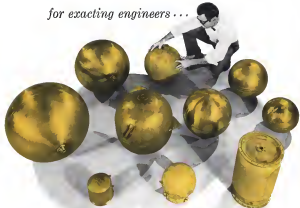
March 23, 1959

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When the "go no-go" signal depends upon a complex of parts and pieces supplied by scores of subcontractors, a missile systems engineer with prime contractor responsibility must have confidence that the multitude of components will stand up to the principles of his design. In the design of modern high-performance aircraft and missiles, often the heart of the propulsion system (or of a major auxiliary system) is a pressure vessel.

Whether specifications call for titanium or stainless steel spheres, or more specialized configurations of even newer metals and alloys, it is the ultimate reliability of the hardware that will prove or disprove the system design. That is why exacting engineers spe-

cify pressure vessels by Rheem. That is why over the past seven years companies like Convair, North American Aviation, and Lockheed Aircraft Corporation have ordered more than 26,000 Rheem pressure vessels for applications in the major aircraft and space projects of the nation.

When an experienced hand in critical welding and machining operations is needed for the production of vessels that can be relied upon, consult the leader in pressure vessels. Consult Rheem early. Let Rheem engineers assist you in the development, as well as in the production, of vessels and containers to meet your specialized needs. Write to Dept. AW-117-L.

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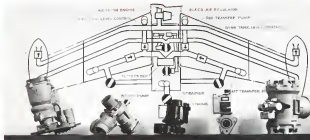
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Booster pumps, transfer pumps, shutoff valves, selector valves, regulators... In the complex fuel-control system of a supersonic aircraft or missile, not only must each component be individually flawless, but all must function perfectly together.

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"GOOD WILL" is the reputation of the pleased customer to return to the place where he has been well treated.
— U.S. Supreme Court

AVIATION CALENDAR

March 31-Apr. 1—National Automobile Show at Society of Automotive Engineers, Ford Convention, New York, N. Y.
Apr. 1—Conference on Electronics, Electrical Design, sponsored by the Thermal Radiation Laboratory of the Gas Research Institute of the Air Force Cambridge Research Center, Concord, Mass.
Apr. 1-6—1959 Nuclear Congress, Marine Hotel, Baltimore, Cleveland, Ohio.
Apr. 6-8—Fifth National Atomic Industrial Conference, Hilton Hotel, Chicago, Ill.
Apr. 8—Aviation '59, 741 Gros. Wy., New York, N. Y.
Apr. 12-13—Annual Meeting, American Society of Naval Engineers, New York, N. Y.
Apr. 13-14—International Conference on Friction, Massachusetts Institute of Technology, Cambridge, Mass. Sponsored by the Office of Naval Research, Office of Naval Research, National Science Foundation.
Apr. 15-16—National Academy of Sciences, National Academy of Sciences, Washington, D. C.
Apr. 17-18—Aviation '59, 741 Gros. Wy., New York, N. Y.
Apr. 19-20—Second Annual Symposium on Instrumentation and Defense Research, Purdue University, Lafayette, Ind.
Apr. 19-20—1959 Annual Meeting, American Society of Mechanical Engineers, New York, N. Y.
Apr. 20-21—1959 Annual Meeting, American Society of Mechanical Engineers, New York, N. Y.
Apr. 22-23—Fourth Symposium on General Development in Research, Administration, American University, Washington, D. C.
Apr. 24-25—Annual Meeting, American Society of Mechanical Engineers, New York, N. Y.

(Continued on page 5)

AVIATION WEEK Includes: Sargent Technology

March 23, 1959
Vol. 35, No. 12

Aviation Week includes a special section on Sargent Technology. This section contains a detailed description of the Sargent Technology and its application in the aviation industry. It also includes a list of Sargent Technology products and services. The section is written by Sargent Technology and is intended for the aviation industry.

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TRANS-SONICS

QUARTECTOR®

LIQUID LEVEL DETECTION SYSTEMS

for liquid oxygen
and rocket fuels



No moving parts ensure unsurpassed reliability

Will not respond to wetting or splashing



IN-TANK SENSOR



ELECTRONIC UNIT
Enables proof means
to guard in station



IN-LINE PROBE

Quartermaster Liquid Level Detection Systems, with no moving parts to stick or freeze, detect liquid levels up within $\pm 1/32"$ with a response time of less than 40 milliseconds. Operating temperature range is from -425°F to $+120^{\circ}\text{F}$.

Quartermaster systems and instruments are designed for bulk liquid applications such as fuel tanks in missiles or other types of pressure vessels, and for pumping applications. A real-time indication is generated when the liquid has reached pre-selected points in pipe lines or tanks.

The Quartermaster sensing element is a piezo-electric quartz crystal mounted in a probe or submersible sensor and. Circuitry consists of a four stage transistor amplifier with a monitor detector circuit in the feedback loop, and an output control relay. When the crystal is in gas, it is free to vibrate at its natural frequency, and oscillation is sustained. When the crystal is submerged in liquid, however, its motion is damped, signal output drops, and the output control relay is de-energized.

Splashing, bubbles, and wetting do not affect the sensor. Liquid indication is given only when the crystal is completely surrounded by liquid. Safety features include a fail-safe and fail-safe test procedure. Write to Quartermaster, Inc., Dept. 7, Burlington, Massachusetts, for Technical Bulletin 1900.

TRANS-SONICS

Precision Transducers

Product



SYSTEMS MANAGEMENT

DIRECTED RESEARCH

DEVELOPMENT

PRODUCTION



ELECTRONICS • AIRCRAFT • MISSILES

STRAIGHT TALK FROM

TEMCO | AIRCRAFT DALLAS

QUESTION: What is Temco's experience in the fields of electronics, aircraft and missile contracts?

ANSWER: During the past 14 years, Temco has successfully completed 35 major programs requiring solutions to engineering design problems in all technical fields involved in the aeronautical sciences. It has produced more than 5,000 components of high performance military weapons systems.

QUESTION: What is the scope of management's knowledge and participation?

ANSWER: Programming under top management is initiated at the earliest project stage and maintained throughout the existence of the job. Overall progress is reviewed at periodic check points, to permit timely corrective action if necessary, and to keep management and the customer informed on the program status.

QUESTION: What are Temco's plant facilities?

ANSWER: Temco has three major plants, comprising over 2,000,000 square feet, fully equipped for the development and manufacture of complete aircraft, missiles and major components. Included is a new Engineering Center with ultra-modern laboratories and experimental design area. Construction is scheduled early this year on vastly increased production facilities.

QUESTION: What are Temco's engineering capabilities?

ANSWER: Temco has over 1,200 engineers whose combination of skills and unique capabilities has established Temco as a leader in advanced technology.

QUESTION: What is the range of Temco's product familiarity and production know-how?

ANSWER: Temco is prime contractor and weapons system manager for the Navy's Convair air-to-surface "stand off" missile, it has designed, developed and produced the TTA "Pave" jet trainer and the XEOT-1 "Tall" rocket powered target drone. In the component field Temco produces range from integrated antenna systems to high production major assemblies for such advanced aircraft and missiles as the F3H, F-101, F-104, B-52G, Hawk, jet engines and work on classified ballistic missiles. In the modification and overhaul field, activities have spread all the way from "PAC" overhaul of C-97s to development and qualification of advanced electronics systems.

QUESTION: What plus does Temco offer?

ANSWER: Temco is known by its customers as a "yellow-through" company, from design to production — a partner on the job — a company that delivers quality products on schedule at the lowest possible cost.

SPACE SAVING DESIGN

**LOCK HOLDS 27,750 LBS.
WITH GEAR COMPRESSED
96% OF STROKE**

Williams Design developed the R-77 wheel axle with a unique "shrink lock" that holds the lock under pressure under 2.6 times the normal compressed pressure. When gear is dropped, lock automatically releases and strut is fully extended. Steel parts are heat treated 202,800-228,800 psi tensile strength.

More than 30,000 landing gear units have been produced by WILLIAMS DESIGN, as well as other ground airframe components, assemblies, accessories, systems and ground support equipment. Engineering skill, experience and extensive production facilities are available to you.

Call or write today for 24-page
facility brochure

WDI Western Design
DIVISION OF U.S. INDUSTRIES, INC.
Santa Barbara and Menlo Park, California
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You can actually bend a Fenwal Continuous Fire Detector System to your needs as easily as a metal chamber handles his pen! It's as supple as a snake!

Proved applications of this advanced multi-point protection system are practically everywhere in aircraft and missiles — for hot gas leaks, smoking systems, and, of course, for engine protection. That's versatility!

Operable lengths of tubing, each at a different temperature, can operate independently in one control loop in a wheel well, near a bleed air duct, in a "hot pack" cargo compartment, in an engine nacelle, or wherever temperature hazards exist. Tagged "static" sensor and magnetic amplifier provide accurate non-actuating sensing of temperatures. And this positive protection is repeatable!

You'll think of many applications for Fenwal Continuous Fire and Overheat Detector Systems. Talk them over with a Fenwal Sales Engineer. Get our latest Catalog, too. Write Fenwal Incorporated, 185 Pleasant Street, Ashland, Massachusetts.

You Call the Tune...

the Fenwal Continuous

Fire and Overheat Detector has hundreds of applications

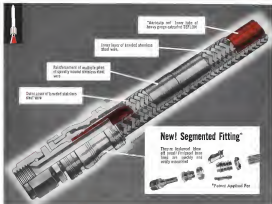
The simple, lightweight sensing tube of the Fenwal Continuous Fire Detector slips easily into the tightest space on a plane or missile. It stays like a chameleon. Tuned to a light, no-moving-parts control unit.



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EXAMPLE
OF HOW

Fenwal

CONTROLS TEMPERATURE . . . PRECISELY



BURST PRESSURE

24,000 psi.!

OPERATING PRESSURE: 6000 psi.

AEROQUIP ANNOUNCES VERY HIGH PRESSURE 678 PNEUMATIC HOSE LINE OF TITLON

Aeroquip makes a major contribution to safety in the handling of very high pressure air, helium, nitrogen and other gases for missile charging systems. Newly developed and now available is rugged 678 Hose of TITLON, rated for 6000 p.s.i. pressure . . . with a 4-to-1 safety factor!

With an inner tube of TEF/30N, which has zero moisture absorption and an anti-sulfur surface, Aeroquip 678 Hose allows fast, easy purging and dechlorination. The line has superior resistance to radiation, low volumetric expansion and high temperature resistance. Return the coupon for complete information.

Aeroquip 678 Pneumatic Hose of TITLON

Hose part number	678 B	678 N
Hose type 1 ft.	312	432
Hose IDH O.D.	609	812
Dynal joints, psi	6,000	6,500
Dynal joints, psi	24,000	24,000
Break radius of assembly	5	10

All dimensions in inches

Aeroquip

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AEROQUIP CORPORATION, WESTERN DIVISION, BURNING, CALIFORNIA

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To keep sensitive equipment, fuels, propellants and lubricants at correct operational temperatures in any cold environment, controlled heat must be delivered with utmost dependability. SAFEWAY delivers it — everywhere.

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FOR YOUR COPY OF A FACT-FILLED FOLDER, PLEASE WRITE:

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INC.

680 Newfield Street • Middletown, Connecticut

If it has to be heated (and the "R" can be just about anything), you can rely on SAFEWAY engineers to study your problem and — without any obligation — submit an appropriate recommendation.



...NEWS IS HAPPENING AT NORTROP

**RADIOPLANE RP-77D
SETS NEW DRONE
ALTITUDE MARK!**

New holder of an unofficial world altitude record for propeller-driven drone aircraft — Radioplane's RP-77D aerial target. This record-breaking bird climbed to more than 46,000 feet during Army evaluation at Dons Air Range, Fort Bliss, Texas.

Sideline on the flight, the record-setting drone had six previous flights to its credit — is ready for further action after its seventh recovery by two-stage parachute.

Rocket launched, Radioplane's RP-77D is capable of speeds in excess of 400 miles per hour at above 40,000 feet — and is capable of flight duration exceeding one hour at this altitude. Relative to performance, it is a low-cost target. Constructed almost entirely of fiberglass laminate, the RP-77D has an additional capability for photo and television camera surveillance missions.

Other current Radioplane drones in development are the supersonic USAF XQ-4A weapon evaluation target and the XQ-48R-1 rocket target for the U.S. Navy — two more members of the world's only complete drone family.



RADIOPLANE

San Diego, California, and El Paso, Texas
A Division of Northrop Corporation

This is the twentieth of a series of advertisements dealing with facts about alloy steels. Through much of the information is necessary to believe it will be of interest to many in the field, including men of broad experience who may find it useful to remove fundamentals from time to time.

Uses of Aluminum in Alloy Steels

Aluminum as an element has been known to chemists and metallurgists for many years. It is never found in nature in its metallic state, being derived chiefly from bauxite, an aluminum hydroxide. Bauxite is present in various parts of the world, including several tropical and semi-tropical regions.

When used in the making of alloy steels, aluminum has several important functions. Because of its great affinity for oxygen, it is a reliable deoxidizer. It produces fine austenitic grain size. And when it is present in amounts of approximately 1 pct, it promotes nitriding. The nitriding process could be described as surface- or case-hardening by means of a nitrogenous medium, or by heating in an atmosphere of ammonia gas and dissociated ammonia mixed in proper proportions.

Other effective agents in producing nitrided cases are chromium, vanadium, tungsten, and molybdenum. As a rule, however, the hardest cases are obtained with aluminum-bearing steels, the nitriding grades being a good example. These are

usually steels of medium carbon content with additions of chromium, molybdenum, and sometimes nickel.

Generally speaking, the lower the effective nitriding temperature, the harder the case will be. Aluminum-bearing steels usually show a case-hardness range of 950 to 1150 DPHN (diamond pyramid hardness number). Steels in which no aluminum is present have cases of substantially lower hardness.

If you would care to know more about aluminum as an addition or alloying agent in steels, Bethlehem metallurgists will gladly give you full information. Just write or call us; our technicians are always at your service. They will do everything possible to help make your problems easier. And whenever you need new supplies of alloy steels, remember that Bethlehem manufactures the full range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades.

BETHLEHEM STEEL COMPANY
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On the Right Coast, Bethlehem steels are sold by
Bethlehem Metals East Coast Corporation
Special Representatives
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BETHLEHEM STEEL



THE HILLER 12E opens new horizons in helicopter performance

Equipped with Macwhythe Control Cables

An engineering triumph in vertical flight, Hiller's 12E provides more than 1000 ft per hour for industrial and commercial users. Its brevity. Its speed. Its 300-hp engine provides greater payload capacity... longer range... superior performance at high altitudes... and remarkable endurance under tough going. With plenty of room for three passengers, the 12E is built on the same dependable air frame as the Army's rugged H-33 (Honey Bee). The 12E leads its class in flight and landing load safety factors.

Every moving part, every component on the 12E was carefully selected to ensure outstanding performance and dependability. That's why Hiller chose Macwhythe control cable for the 12E's main rotor and tail rotor systems.

Macwhythe "Hi Fatigue" Aircraft Cable is made in a complete line of sizes and types. Macwhythe "Side-lock" Cable terminals of standard steel are available loose or in complete assemblies ready for installation. Macwhythe Aircraft Cables, Terminals, and Assemblies meet the requirements of aircraft manufacturers, airlines, and military specifications. Aircraft Catalog A-2 on request.

MACWHYTE WIRE ROPE COMPANY,

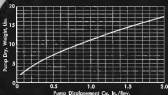
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Distributed and checked throughout the United States

VARIABLE DISPLACEMENT



Model	Displacement In./Rev.	BPM	GPM	Max. RPM	Weight Lbs.	Length In.
P126	1.793	4000	29.4	5000	5.750	3.320
P120	.863	4000	13.3	5000	5.350	2.250
P101	.548	5000	13.3	6000	4.517	2.625
P111	.523	10000	7.2	10000	3.900	4.258
P11	.115	12000	0.5	16000	2.750	3.025
P104	.861	10000	9.1	10000	3.325	3.325
P144	.241	12000	2.2	16000	2.375	3.042

A NEW FAMILY OF . . . HYDRAULIC PUMPS WITH THE LOWEST WEIGHT DISPLACEMENT RATIO

For Aircraft, Missiles, and Systems!



This new family of rotary vane pumps is furnished with forged aluminum housings for fluid operating temperatures to 500°F. Thousands of hours of endurance and qualification testing, as well as flight tests, have proven that these new pumps will successfully handle all MIL specification hydraulic fluids including Orange 815 and well coated MIL-P-16102 specification requiring 750 hours of endurance. The low weight displacement ratio is accomplished

by utilizing space not available in other designs in accommodation of the variable displacement feature and servo system. Pumps operate on an inclined axis to provide amplified servo force and are arranged such that the side loading on each pump is maintained when the maximum average axial cutting.

Fixed displacement pumps are also available in all models with reduced weight and envelope dimensions.

The proven experience of Bendix in remanufacturing thousands of direct injection pumps and fuel systems for reciprocating engines, fuel supply pumps, fuel systems for turbine engines, hydro-air pumps, and hydrostatic systems for high performance missiles assures you of a quality unit or system meeting the high reliability standards of the industry.

FOR 300 AND 400 PSI
SPEEDS TO 10,000 RPM

HAMILTON PRODUCTS—manufacture and distribute hydraulic pumps, turbine components and fuel systems components, hydraulic valves and flow control assemblies, electrohydraulic and solenoid valve assemblies, and self-vented manufacturing and testing.

Hamilton Division

HAASZEH, OHIO



EDITORIAL From Capitol Hill

As Congress heads for its Easter recess, the pattern of debate on key areas affecting the aviation industry and its related technologies is becoming clearer. Brightest spotlight continues to be focused on the Defense Department budget where the basic advantages of our military program are being challenged by an increasingly large group of congressional critics. Although the critical edge of this debate has been sharpened by such leaders of the Democratic majority as Senators Lyndon Johnson, Richard Russell and Stuart Symington, they have been joined in recent weeks by such Republican stalwarts as Senators Leverett Saltonstall, Stephen Hughes and Jacob Javits.

President Eisenhower has made the strongest personal effort to back his Fiscal 1960 defense budget, including nine successive weekly press conferences, a national television appearance and the most unusual device of having each member of the Joint Chiefs of Staff formally sign a document stating that the defense budget was "safe" for the country. The effect of these Joint Chief signatures on the document was somewhat limited by a series of amendments filed by each service chief detailing the vital programs in his area that were omitted or grossly curtailed in the "adequate" defense budget.

Key move on which the Fiscal 1960 defense budget debate appears to hinge is the gap in ICBM strength between the U.S. and the USSR that the Administration adamantly and deliberately now plans to permit during the next five years.

No American citizen was left very secure over a deliberate decision to allow a potential enemy the opportunity to build a strategically significant lead over this country in the most technically advanced type of weapon likely to be available during the next five years—the liquid-fueled, mutually assured ICBM delivering a multiple payload warhead.

Defense Secretary Neil McMillen has stated that the Soviet lead in this area would amount to a three-to-one edge by the end of 1961 under present plans. Sen. Symington has noted this also in floor-speeches on the basis of the same evidence used by Secretary McMillen. But solid glowing figures actually being used in the Pentagon come close to doubling these quoted odds that this country will lose in ICBM capability by the end of 1961. In the face of this evidence, even such conservative Republican journals as the New York Herald Tribune and Life magazine have followed AMERICAN WARREN's earlier lead and called for a reevaluation of ICBM production and operational programs with a view toward increasing their significance to meet the Soviet challenge.

USAF has now drafted a program aimed at doubling production of the Atlas ICBM, the only such result now sufficiently advanced along the development cycle to warrant such consideration. But this program, while now solidly supported by USAF, has yet to clear the Defense Department budgetary hurdle and has yet to be authorized by the White House.

Watch for card debates to get an increasingly close scrutiny on Capitol Hill during the remainder of this

session. Sen. Mike Monroney, an influential leader in this area, is not satisfied with the course of federal support and policy as pushed by the Administration. He will also keep an eagle eye on this burgeoning operation of the new Federal Aviation Agency. Adequacy of present and proposed airways modernization and safety programs will be a subject of increasing debate. Possible dominance of the FAA by a relatively small but key group of military officers is also a worry on Capitol Hill.

Military Air Transport Service will get back into the congressional spotlight with its proposal to begin buying DC-8's or 707's for transports, basically passenger transport designs healthy and impressively converted to cargo versions. The knocking landing gear and winged landing crutches of these jet transports sought for MATS use will be a highly controversial issue, both on Capitol Hill and within USAF. There is a strong feeling in USAF that makes an excellent case for the use of turboprop-powered heavy logistic transport specifically designed for cargo operations.

Then at a growing groundswell of curiosity on Capitol Hill over the course being taken by the House Space Committee headed by Overton Brooks. Last year, this committee headed by Majority Leader John McCormack had an outstanding job in handling legislation that created the National Aeronautics and Space Administration. This year, his heavy duties as majority leader prevented Mr. McCormack from continuing leadership of the committee. With 19 freshmen congressmen as added to it and a new chairman, this committee faced an admittedly difficult task in equating the excellent record of the previous committee and its professional staff.

Chairman Brooks has so far displayed a shrewd approach to the serious problems of getting the national space program organized and accelerated. In several cases, the committee has stayed far from its legislative terrain. As an example, investigation of the Nike Zeus anti-ICBM program is clearly an outcome of the space committee. It is obviously the business of the Armed Services Committee. We strongly recommend that the House Space Committee and its chairman make a serious reappraisal of their program before they lose too much of the reputation for solid, serious contributions that this group earned last year. They should also strongly consider the amount of precious time wasted by the same busy duplication of testimony before a variety of groups by the key people in these programs.

As the political temper of Capitol Hill becomes hotter with the approach of the 1960 presidential election, aviation leaders will face an increasingly difficult problem of getting these vital issues debated and legislated without the stress and strain of partisan politics. We hope they will make every effort to impress on Congress the vital strength that aviation now adds to our national structure, from fast transports to gathering new strength from the stars. With this in mind, it should be obvious that a sound national aviation policy will best serve both parties and the people who support them.

—Robert Hoke



HIGH-SPEED GEAR PUMPS FOR THE NEXT GENERATION OF AIRCRAFT-MISSILES-SPACECRAFT



High performance hydraulic pumps by Eastern are uniquely suited to the exacting operating requirements demanded in the craft of tomorrow.

Check these Eastern gear pump features — do they suggest a solution to your present design problem?

Small size: Eastern gear pumps are the smallest, lightest made. Airborne version system pump shown delivers 1.5 gpm @ 1500 psi — measures only 1 1/2" x 1 1/2" x 2 1/2", weighs 9 oz.

Wide performance range: pumps available have theoretical displacements from .0016 to .0415 cu. in. per revolution — flow from .025 to 2.0 gpm, pressure from 0 to 2500 psi, at speeds to 24,000 rpm. Weights with meter range from 1.5 to 8.3 lb.

Unaffected by extreme environments: rugged, reliable Eastern units take loads to 60g in shock — shag off temperature differentials to meet MIL specs.

Flexibility, economy: mass-produced components can be tailored into the precise configuration you need. Creatively-engineered custom pumps also available.

Central Eastern Air creative contributions to help you solve your hydraulic pump or power problems. Write for Bulletin 360 — your complete new guide to Eastern aviation products.



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HYDRAULIC POWER • ELECTRONIC COOLING • REFRIGERATION TYPE COOLING •
PRESSURE-CONTROL SYSTEMS • AIR-DRIVEN HYDRAULIC SYSTEMS

WHO'S WHERE

In the Front Office

J. S. Wankmeyer, president, **Suamico Co.**, 1000 E. 1st Ave., Suite 100, St. Paul, Minn. 55101. Wankmeyer succeeds **T. O. Swenson**, who is now directing activities of a separate firm devoted to the design and development of new products.

Carl David Hubbs (OS/IF), senior vice president/manager of the newly incorporated **Delco-Romex** Aircor Inc.

Richard W. Hollings, president, **Autumn Corp.**, Los Angeles, Calif.

Arch T. Colwell, vice president/general mgr., research and development, **Thompson Research**, 10000 E. 1st Ave., Cleveland, Ohio. Also **Raymond S. Livingston**, vice president human relations.

L. Gene Jason M. Davis (USA, AF), executive vice president, **Arthur D. Little Inc.**, Cambridge, Mass.

Paul J. Reeves, vice president/sales, **Tim Lee**, 1000 E. 1st Ave., St. Paul, Minn.

Frank E. Powers, executive vice president, **Aerotec Corp.**, New Bedford, Mass. Mr. Powers succeeds **Robert Conway**, who now runs the executive operations.

C. Lee De Orey, Washington attorney, a director of **Fairchild Engine and Auxiliary Corp.**, Hagerstown, Md.

Norman G. Fethering, vice president and technical director, **Airco Inc.**, Waltham, N.Y.

William A. Gault, vice president/sales and **Paul A. Tinsley**, vice president/sales, are **Avionics** directors of **Electronic Communications, Inc.**, St. Petersburg, Fla. **Edmund A. Penna**, director of the **Avionics** Group, **General Electric**, is also a director of **Avionics**.

The following new hires have joined the **General Aviation** Division of **General Electric**. **Robert A. Wankmeyer** (OS/IF) is **General Electric** vice president, **Electronic** Division, **General Electric**, St. Paul, Minn. **Robert A. Wankmeyer** (OS/IF) is **General Electric** vice president, **Electronic** Division, **General Electric**, St. Paul, Minn. **Robert A. Wankmeyer** (OS/IF) is **General Electric** vice president, **Electronic** Division, **General Electric**, St. Paul, Minn.

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(Continued on page 56)

INDUSTRY OBSERVER

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- Search and Tracking Radar Set, RUMFO 73
- All Weather Radar Free Tracking System



David Phillip Byrnes, R. E. McCulloch has 17 years' experience in the development of air defense systems, including R and E and Radar Systems, Radar Free Tracking, Radarless Search and Tracking and Radarless Tracking.

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Washington Roundup

Missile Management

House Military Operations Subcommittee headed by Rep. Carl Albert (D-Calif.) will call in major contractors beginning April 5 for testimony on their experiences under the missile programs managed directly by Army and Navy and under USMC programs managed by Space Technology Laboratories (see p. 14). Other development contracts include:

- **General Accounting Office** is making field audits of 35 Atlas, Titan and Thor contractors in connection with its comprehensive investigation of USMC ballistic missile program under SIV, management (AW, Nov. 17, p. 14). GAO plans to submit its report to Congress before the mid-year adjournment.
- **House Information Subcommittee** headed by Rep. John Moss (D-Calif.) last week issued a report demanding Air Force for reimbursing the complete stock of the ballistic missile program to the USAF, irrespective of form GAO (AW, Nov. 24, p. 14). Declaring that USMC is "seized" has no station authority" and "is based solely on a ruled class of 'investor privilege'" the subcommittee added.

"The Air Force refused to let us see the GAO to try to duplicate the work of the Inspector General. This will cost an estimated \$175,000 and require further time on the part of Air Force technical and opposition personnel—time which could be better spent on its missile program. The almost total refusal of the Air Force, however, leaves no alternative. The Air Force refused to make available the backup material collected in the course of the Inspector General's review unless it didn't fail, even with the extra expenditure of time and money, that the General Accounting Office could duplicate the Congressional work and obtain the full facts about management of the cost-benefit missile program."

White vs. Symington

Despite persistent gauding from Sen. Stuart Symington (D-Mo.), Air Force Chief of Staff Gen. Thomas D. White finally defused an attack made by the President in the Press 1960 budget in testimony before the Senate Preparedness Subcommittee.

Properly chastised, Gen. White said, might have been "desirable," but they were not "vital." White White balked at discussing in connection of production of the USAF-Govcon Atlas missile to close the gap in production in ballistic missiles which will develop if Russia fully utilizes its productive capacity, Sen. Symington declared.

"If Congress had as little apprehension as the Joint Chiefs have with respect to what the Russians are doing in regard to what we on this side of the Atlantic are in a position to do, they would be in a better position to do so," White said. "U.S. plans are for 100 Cos White said."

• **White** all was prepared of a Russian ground war over Berlin—a direct contrast to Gen. Maxwell Taylor, Army chief of staff, and Adm. Almiral Burke, chief of naval operations.

• **Opposed** a pending request by NATO command Gen. Lucian Nedelcu to be immediately, recommending, "I do not think it is necessary, but if I were in his shoes I think that is what I would recommend."

• **Endorsed** the current expenditure of \$1.5 billion a year in U.S. air defense—much Adm. Burke suggested might be better devoted to offensive studies.

Renegotiation Proposal

On another front Rep. Carl Albert (D-Calif.) proposes to open renegotiation legislation to the light of day. King has introduced legislation which would require the board to furnish a constructive full explanation of both cost and revenue before making an excessive profit under contract. It also would require public reports on all major contracts. Because this is not done, now, King declared, the Congress, the public, and the contractors before the board are unaware of circumstances which may develop in the administration of the act resulting in substantial and disproportionate reduction of an important matter.

King is a member of House Ways and Means Committee which will soon consider construction of the renegotiation law, due to expire June 30. The bill also would:

- Limit even profit margins on increasing type contracts.
- Require the board to furnish a full explanation of the "costs" plus 10% of the amount of those profits.
- Authorize review of tax cost decisions on renegotiation cases by the U.S. Court of Appeals.

Hardened Bases for Atlases

Defense Department is currently considering a proposal to provide Air Force with the necessary funds to harden the government's launching area for the Cosmo Atlas intercontinental ballistic missile in roughly the same manner now planned for the Minuteman ICBM in view of the growing Soviet missile threat.

Joint Chief Appointments

Gen. Maxwell D. Taylor will step at the expiration of his term as Joint Chief of Staff on June 30 to be succeeded by Gen. Lyman L. Lemnitzer, now Army vice chief of staff. In announcing his achievement the Joint Chiefs and that Taylor, recently completing his second two-year term at the post, had told Defense Secretary Neil McMillen that he did not want to serve a third term. The Warlike House also stated that Gen. Taylor was resigning, or being dropped, because of his publicly expressed opposition to the Fiscal 1960 defense budget (AW, May 16, p. 20).

In announcing Gen. Lemnitzer's appointment, President Eisenhower also announced the Joint Chiefs of Staff. Taking his appointment as chairman of the Joint Chiefs of Staff, a post he has held since Aug. 15, 1955, Adm. Almiral Burke has a second two-year term as chief of naval operations, and Gen. Thomas D. White has a second two-year term as Air Force chief of staff.

The 10th member of the Joint Chiefs, Marine Gen. Randolph Pace, finishes his second two-year term as Dec. 31. He is expected to retire at that time.

Non-Skied Review Disputed

Major hand, even are taking a dim view of non-skied review petition filed by 11 non-skied operators who failed to qualify for permanent status in the strict Long Range Inertial Air Carrier Investigation. The Civil Aeronautics Board ordered a "revised, revised" review of the non-skied operators in the case, the operators complain, and should be held before dropping the quick review will further.

—Washington Staff

NASA Details Procurement Procedures

Civil space agency adopts decentralized approach; drafts formula to cope with expanding program.

By Evert Clark

Washington—National Aeronautics and Space Administration is taking a streamlined, decentralized approach to procurement in an effort to handle with agility a buying program expected to grow from \$220 million in Fiscal 1979 to \$2 billion annually within the next few years.

T. Keith Glennan, NASA's director, has told Congress that he foresees budgets of \$2 billion by Fiscal 1982 or 1983. He has estimated the cost of the space vehicle booster program alone at \$2 billion and has said that it will take \$200 million to bring the 15 major life support element together to a state of readiness and another \$200 million to complete the Mercury man-space project.

NASA not only must provide the great bulk of this effort, but it also must organize new efforts and operate under the constraints of the various arms of agencies that Glennan has promised. In making the transition from the \$100 million (via National Advisory Committee for Aeronautics) which procured almost nothing but its own construction work and development and test equipment—the new agency must take care not to change the in-house research capability that it inherited from NACA.

To meet the challenges in the procurement area, NASA is seeking ideas upon flexibility and the strict use of existing procurement regulations and grants where possible.

Flexibility at the moment is largely a matter of lack of staff. The old NACA had a headquarters procurement staff of 10 or 11. Last Jan. 19, when Ronald W. Bicknell became the space agency's director of procurement and contracting, he inherited at his disposal a staff of 11 including division support.

Bicknell, who was formerly contract

specialist and consultant to the director of procurement and production at USOP's Air Material Command, intends to lead the staff as well as provide in-house flexibility.

A major part of NASA's procurement philosophy is decentralization, primarily in large categories of property and technical integration of contracts due to the research center most concerned with an specific project.

Contracting Centers

This decentralization means that there will be five main contracting centers:

- **Space Science Center** at Beltsville, Md., a Washington suburb. Although construction of the center has not yet begun, procurement personnel at NASA already are organized into a "Beltsville group" and a "Beltsville group."

- **Langley Research Center**, Langley field, Va. Procurement officer for supplies and equipment is Steven L. Bickel, and contracting officer for construction projects is J. Cabell Mendenhall, chief of the engineering services division.

- **Lewis Research Center**, Cleveland, Ohio. Procurement officer for supplies and equipment is E. C. Berg and contracting officer for construction is Charles A. Brownlee, chief of technical services division.

- **Ames Research Center**, Moffett Field, Calif. Procurement officer is M. E. Boring.

- **NASA's Western Construction Office** is being moved to Santa Monica, Calif., and its staff enlarged slightly to coordinate and administer contracts in the western states and to handle some tasks as facilities rapidly expand. It will not issue new contracts.

An indication of the speed with which NASA has done its contracting since it became operational last Oct. 1

is the fact that the great bulk of the \$220 million Fiscal 1979 procurement program had been procured and more than half of it had been obligated by mid-February.

NASA began by adopting the Armed Services Procurement Regulations, with much use of its contractors already were familiar. Although NASA is in expanding change whenever it finds that its special requirements differ from those of the ASPR, Albert F. Kipert, director of business administration, estimates that the rule will be about 95% ASPR and 1% change in most contracts.

NASA also is making an effort as far as possible to utilize existing offices to administer the in-house contracts. It will do its own technical monitoring of contracts, however. In the case of the Beltsville "Science" office, NASA has one technical person there now.

The seven rest is a decision maker. Support staff, but as a technical. Number of technical person rest will vary with the workload. For most of the contractors of the contract, NASA has relied on the Air Force—the contract service those—just as it has relied on the Navy to administer the Beltsville rest of the contract.

NASA also will afford the services to increase contract staff, and it intends to require rest, NASA may do its own administration or provide funds for an increase in the service staff.

Where it can, NASA intends to administer its contracts. An example is a contract, to be awarded by the Lewis Research Center this week, to one of two firms that responded to an invitation to supply NASA's liquid nitrogen for the Galileo-Satellite-2000 for the

Mercury Contract

Washington—First contract for the Project Mercury man-space capsule has been signed by National Aeronautics and Space Administration with McDonnell Aircraft Corp. Contract is for \$20 million. Project ultimately is expected to cost \$1.5 billion. NASA also has announced these contracts, all signed in February.

- **Minneapolis-Hawthorne** Regulator Co.—\$175,000 to produce probes for four-stage solid-propellant Project Mercury rocket.

- **Avco General Corp.**—\$175,000 for shipping gear for Avco Project Mercury boosters to be used in flight.

- **Southwestern Industries**—\$175,000 for electronic testing and data collection.

next four years. The hydrogen will be used in space vehicles and on-orbit engine research.

Most complex procurement problems, however, will come in the night and, cost-plus-fixed-fee contracts. These contracts will follow closely the pattern already set with the award of an initial \$50 million to Rockwell for the 150-ton hydrogen and the initial Mercury capsule cost of \$10 million to McDonnell.

Bids will be invited from a number of companies selected from NASA's source lists. Other companies, which are not invited initially but feel they have the capability to bid, also may attend bidders' conferences. About one-third of the firms attending the Mercury bid conference at Langley last November fell into this category. None of the firms initially selected was a bid. Nevertheless, Rockwell and NASA, in holding one backward to let other companies with a capability to bid a chance, and is encouraging firms to request Bidders' Meeting List Applications or otherwise to bring themselves to NASA's attention.

So companies were invited to bid in the \$150-million hydrogen contract. They were given six months to develop proposals. A bond covering precisely the amount of the contract was required by law and final final developed a selection formula—weighing engineering approach, experience, estimated cost, etc., and selecting those a certain number of points each—before they saw the bids.

Selection was then made "bids plan" contract proposals were provided Rockwell for a week of review, and a definite contract was awarded for development and completion. Final contract negotiations were completed within one week, and the first firm bid invitation to the contract signed last Feb. 15 on 11 terms.

Mercury's contract award process was handled quite quickly, with 34 firms attending the bidders' conference and 12 submitting bids. Selection was made at Langley, where Robert Gilchrist leads the project. The legal and price audit staff supplied from Washington. The selection board listed those companies in order of preference. Its report was forwarded to Glennan and his staff and a preliminary was made. Glennan contacted on the board's first choice, and the contract with McDonnell was signed last Feb. 5.

NASA is writing applications covering selection bonds, which have no formal impact in yet, and is beginning a complex problem: trade between progress. It also is drafting special patent rights laws, more by law it take take full and take value of each, upon selection, it is in the public interest to do otherwise.

Millstone Hill Radar Unit Makes Venus Contact at 28 Million mi.

By James A. Flegal

Westford, Mass.—First radio contact has been established with the planet Venus. Signals transmitted from the high-power Millstone Hill radar of Massachusetts Institute of Technology's Lincoln Laboratory and reflected from the Venusian surface have been received at a range of about 28 million miles, more than 100 times the longest range previously achieved by radar.

The first successful attempt at interplanetary contact can have far-reaching implications in the field of space technology in addition to the more obvious contribution to solar observation. The experiment has provided the theoretical bounds of interplanetary communication, it can and the more accurate determination of the size of the solar system and, in providing more precise information about the most position of planets in relation to Earth, contribute to the navigation in space of unmanned probes and manned space vehicles.

Successful contacts were made Feb. 10 and 12 of last year. Signals transmitted by the large research radar system in ground with low noise, solid state Millstone Hill generated and recorded an magnetic tape. The tape record was accurate to the fact that very weak signals could be pulled out of the background noise by computer electronic analysis via a digital computer.

The most distant target previously detected by radar was for Mars, last detected in 1946. In completing the second step in Venus, the signals from Millstone Hill traveled approximately 56 million miles.

Astronomers have for some time been waiting for the first radio detection of one of the planets because of the great accuracy with which radar can measure distance. Distances between bodies within the solar system are known to a very high degree of accuracy relative to one another, but absolute distances are known only approximately and the optical techniques used to obtain these estimates are considered to have been pushed to their limit. By determining one, one distance accurately, it is possible to calculate the other interplanetary distances more accurately.

The Venus contacts on Feb. 10 and 12, 1978, provided two very precise measurements of the round trip travel time of the radio signals. With proper interpretation, these measurements

should make it possible to fix the size of the solar system to an accuracy of 0.001% which is about 100 times better than has been attained with optical techniques.

Calculations made during the past year from the Lincoln Laboratory data indicate that the dimensions of the solar system are slightly smaller than previously accepted values, but these results are considered preliminary and further analysis is planned.

In measuring the round trip time from earth to Venus, it was found on Feb. 10, 1978, to be 295.3903 sec, which corresponds to an approximate distance of 157,300,000 mi., and on Feb. 12 to be 322.8943 sec, corresponding to a distance of approximately 28,127,000 mi. One very important aspect of the experiment that still requires further study before the exact dimensions of the solar system can be fixed is the velocity of propagation of the signals. The approximate distances given are based on certain assumptions with respect to the speed of light. The distances obtained appear to be in good general agreement with accepted astronomical data.

Distances within the solar system are usually measured in terms of the "astronomical unit," which is defined as the mean radius of the earth's orbit around the sun (about 93,000,000 miles). Preliminary calculations indicate that this unit and therefore all interplanetary distances may be about 0.1% smaller than the currently accepted value.

The differences measured between the round trip travel times on Feb. 10 and 12 was 4.4777 sec., indicating that Venus had moved 66,648 mi. farther away from the earth in the two days. This is in close agreement with the distance increase calculated from the most accurate astronomical data, the measured value differing from the predicted value by only 0.003 sec., corresponding to a distance of about 200 mi.

In spite of the increased receiver noise which provided by the Millstone Hill radar was expected to be too weak to detect or measure satisfactorily in the noise.

Several weeks of computer time were required for processing the tapes. About 600 calculations were necessary for each test, each calculation adding about 3,800 separate signals to save those above the noise level.

ALBION Bidders

Washington—Twelve companies and industry firms are reported to submit proposals for development of Air Force's new OS-10A, an unclassified reconnaissance target vehicle (ALBION) is, based on a contract to Homad Div., Fort Belvoir, Mo., Fort Belvoir, Mo., McDonnell, Northrop, Rockwell, Raytheon, Republic and Texas Instruments consisting of Bell Aircraft/Thompson Ramo Wooldridge, Douglas/General Electric and Lockheed/Convair. Bids were scheduled to make and presentation for work at Wright-Patterson AFB in Dayton.

Synthetic Chemicals May Replace Petroleum Fuels in Rocket Engines

By Michael Yaffee

New York—Combustion of solid oxidizer with new solid fuel as Rocketdyne Division of North American Aviation may mean the replacement of RP-1 petroleum fuel by synthetic chemicals in large liquid rocket engines now in the early stages of development, and possibly in existing engines such as the Atlas (ICBM) powerplants. Rocketdyne researchers have been evaluating diethylhydrazine, a synthetic chemical that can be made as a byproduct in the manufacture of nitric acid, as part of the Air Force's continuing propulsion product improvement program. The chemical reportedly shows some promise over any of the approximately two dozen other fuels that possibilities examined by Rocketdyne in the past few years. Specifically, its evaluation has been carried further. Both Air Force and Rocketdyne, however, strongly want propellant suppliers that making such production in that time scale and, more importantly, at \$50,000 lb of diethylhydrazine produced by the Air Force for the tests from Monsanto Chemical Co. and Union Carbide Corp. was made on Jan. 8. Rocketdyne is expected to complete its evaluation in a matter of weeks and at that time will make its report to the USAF's Ballistic Missile Division which then will decide on the merits of the materials in possible use.

BMDD's decision will be a difficult one, requiring a great deal of careful consideration and time. It will have to weigh the material's high price, approximately 10 times that of RP-1, against improved engine performance. Rocketdyne engineers do not consider the cost out of line provided diethylhydrazine does away with the engineering limitations imposed upon the design and operation of large rocket engines by the varying chemical and physical properties of different families of petroleum derivatives such as RP-1. A narrow cut material, RP-1 is distilled out of crude petroleum over a comparatively narrow boiling range. Developed in part of the same petroleum product improvement program, its evaluation was not defined so that it would contain fewer of the straight-chain hydrocarbons found in the material but had more of the cyclic hydrocarbons which seem to have been found to be more thermally stable, hence, more desirable for high temperature fuels.

At first, dedicated batches of RP-1 consisted mostly of the desired cyclic hydrocarbons. Later, in more oil-conscious times, the idea of going to synthetic material to get consistently reproducible characteristics rather than depend upon the vagaries of nature and distillation processes.

To satisfy the substitution of a new fuel in an already developed missile system, the new material would have to have chemical and physical properties close to those of RP-1. Rocketry would then use cyclic hydrocarbons substitutes in diethylhydrazine, dimethyl and isopropylhydrazine (AW 31, 1958, p. 24). Diethylhydrazine was decided upon as potentially the most suitable choice because it is especially in demand of the Atlas program, easiest to make and least expensive.

Diethylhydrazine can be made simply by the hydrogenation of diethylbenzene which is produced along with the ethylbenzene required to make styrene. Many styrene products, namely, Dux, Koppers, Monsanto, Shell and Union Carbide, have generally recovered the diethylbenzene from the styrene chemical, but it could

be pulled out of the styrene process stream with little effort and converted to diethylhydrazine.

DECH is a water white liquid of the empirical formula C_4H_{10} with a molecular weight of 100. Its density is approximately the same as that of RP-1, respectively 80 and 81. Its heat of combustion is 18,000 Btu/lb. for RP-4. It has a freezing point below -118°, a flash point of 110°F. and vaporizes only slightly below. Diethylhydrazine, in effect, could be substituted in the Atlas engine without requiring any changes.

Shell Chemical is now quieting the market at 32 cents a pound in less than a dozen quarters. Should a new molecule as aircraft market develop, however, Shell and other believe the eventual price would come down to approximately 17 cents a pound or about 55¢/gal. A gallon of RP-1 sells for approximately 11 cents, which gives it a decided edge. Wide availability of fuel is another advantage of RP-1. It is that the reason that the interest in continuing its interest in petroleum derivatives is evidenced by the petroleum products improvement program.

The chemical industry is hoping that diethylhydrazine makes the price and is applied to RP-1 suitable for both rocket and jet engines.

Minuteman Funds

Boeing Airplane Co. has been allotted \$102 million for Minuteman airframes, would include missile research and development covering a four-year period. Work will start soon at Seattle on assembly of the vehicle from a precast concrete, and also will include a portion of the new extensive ground-to-air command plane (AW 30, p. 64).

Pratt & Whitney for the four-year period will be in excess for period ending June 1959—\$37 million, for Ford 1960—\$55 million, for Ford 1961—\$47 million, for Ford 1962—\$48 million, and for Ford 1963—\$57 million.

No official word on the contract award responsibility for ground command for Minuteman has been made by Air Force's Ballistic Missile Division, which has custody of the program, but indications are that Boeing will be given the job along with its assembly and test side. However, major components of the ground command system be required and controlled for directly by RND with other military agencies.

Industry, in general, is watching closely the final evolution of the ground command plane responsibility with no one participating with Boeing as a team member in subcontracting.



TWA Changes Fuselage Markings on 707 Jet Transports

Trans World Airlines is adding a red arrow design on Boeing 707 120 jet transport scheduled to start transatlantic service last Friday between New York City and San Francisco. Color Company and cardboard paint will be 5 in. 4 in. wide, 4 in. 4 in. long. Some configurations will be 40 ft. 4 in. and 40 ft. 4 in. (AW 30, p. 37).

Engineers' Charge Disputed by ALPA

Washington—Air Line Pilots Assn last week lashed at "unsubstantiated and unfounded" charges in the Flight Engineers' International Assn that a group of Eastern Air Lines pilots violated flight safety regulations (AW May 16, p. 34).

Replying to the more than 200 complaints filed by FIEA with the Federal Aviation Agency that some Eastern pilots are usurping the duties of flight engineers and creating hazardous flight conditions, violations for the pilots' union and the cockpit dispute can be traced to both on the part of both flight engineers and Eastern operations manuals.

Many engineers, they said, have failed to accept their proper position as flight crew specialists and have instead pilot control authority is established by the Civil Aeronautics Board. The ALPA spokesman also is determined to see the complete removal of flight 50 to split out the captain's authority to delegate crew duties under FAR 49.83(b) into a charter.

The engineers' union, however, stressed its strong belief flight safety can be maintained by following mandatory operations manuals written in conjunction with aircraft manufacturers and the FAA. In answer, George R. Petty, Jr., president of the engineers' union, said FIEA has no intention of relieving upon the pilots' command authority but that if the pilots "think" we completely do not constitute violation of safety regulations, and we do, there is an appropriate place (the FAA) where that can be decided.

Half one of the current dispute between pilots and engineers at last can involve visual FIEA accusations that the violation of some operators an ongoing error flight engineer duties and actual to operate aircraft in that emergency with complete operating manuals as resulting in hazardous flight conditions and an increase in engine maintenance problems.

Understandings of pilots with current flight engineer procedures then that has been most apparent as the cost of buying of engines on hand and failure to maintain proper engine health inspections.

Eastern Air Lines told its flight manual that engine failure for January 30 was three times the number recorded in the same month in 1958. Total premature removals of 37 engines occurred, as compared with only 16 for January of the previous year, along with 10 in-flight turnarounds of Atlas D-11 transport engines used on the Eastern as reported in "Catastrophe an operational problem of the last airplane," according to Eastern maintenance officials. To prohibit this on such records are particularly true for a wide number of months. Pointing out that normally, low operating temperatures occur in the winter's season during January and February usually lead to lower difficulties concerned due to heat shock in burned valves and pistons and high oil consumption.

Eastern's report and three figures combined with other information suggests that some engines have been operated at excessive temperatures and, in some cases, there is evidence of engine power being used.

Space Council Staff Appointments Urged

Washington—Flight action in appointing a professional staff for the National Aeronautics and Space Council as provided by law was urged in the first report of the Special Science Committee on Space Staff Administration released last week.

The special committee, succeeded by the Studying Science Committee on Aeronautics and Space Sciences, said that, without such a staff, management Congress would have an impact from which, without and dependable information can be obtained except in the President's annual report.

The committee pointed out that no organization has yet been selected for the position of executive secretary and that it has not been able to ascertain just what progress has been made in making appointment of a staff professional. The council was created by the National Aeronautics and Space Act of 1958 and members were appointed last year. The Act also provided for a staff.

Other recommendations in the Special Committee's staff report include:

Relationship between the Space Council and the Federal Council for Science and Technology, being created by the White House, will require further study. The report said the suggested initial membership overlap that of the Space Council is a number of instances and urged the Studying Committee to determine if duplications exist and to what extent these two committees will meet most needs of Congress.

ECM Decay Study

Los Angeles—Aeronautical Systems, Inc., has been awarded a \$2,127,000 contract by Air Force Ballistic Missile Division for development and testing of devices to detect enemy ECM defenses.

Project will be assigned to Aeronautical's Space Technology Division. Project objectives and major elements of the company's ballistics missile program will be tested at Newport Beach, Calif., where Aeronautical is building a permanent headquarters and research center.

Ralph P. Morgan, Jr., is project manager and will be given a staff of about 30 scientists and technicians.

Justice Department May Join ATA Probe

Airlines feel investigation will cause deep rift in relations with Board, inquiry aims unclear.

Washington—Upstream Civil Aeronautics Board order calling for an inspection of the Air Transport Association (ATA) May 16, p. 37) was followed last week by a request from the Justice Department which wants to conduct an investigation of its own.

In a letter to the Air Transport Assn., the Department of Justice and its sought access to the association's files for the purpose of conducting an antitrust investigation. The letter noted that the Board was now inspecting the association and suggested a "coincident" investigation would cause a continuum of incoherence to the ATA.

Meanwhile, Civil Aeronautics Board led no time in launching its all-encompassing inspection and search of the ATA. First before the order was presented to ATA, five Board staff members went on its headquarters' offices here to begin the probe.

Later were opened for photographing and at least one attempt to inspect the dock, driven off by ATA guards who made. However, the move by the inspectors to look into the personal files of ATA President Stuart G. Tipton was thwarted.

Outwardly, the industry is accusing the order's scope, and the Board has actually taken the position that this inspection is not a "Gestapo" action but a natural postorder step taken in the public interest.

Following receipt of the Board order, Tipton announced publicly that the ATA will "be happy to cooperate" in the inspection and review. But the chairman of the Board and ATA officials are also clearly nervous to give down the heavy inspection originally attributed to the order.

Finally, however, airline officials are not taking the order lightly and a number of staff contacted over the Board action which are spokesman termed "unsubstantiated and ill-informed" as view of the thought of major steps the Board has taken to inspect the ATA.

General feeling among the industry is that the Board action will have at least one verifiable effect: it will create an even greater divide—if not in regard to itself—than now exists between the CAB and the industry which the CAB is required to regulate. Beyond this, industry spokesmen contacted by Aviation Week are provided as to just what the Board expects to accomplish by the inspection.

Spokesmen for the Board have not been willing to elaborate on this point

and have merely stressed that the "order really has itself." One representative of the Board felt go so far as to suggest that the order purpose of the inspection was to determine the relationship of the carrier to the ATA with the view of clearing up an "possible conflict with the anti-trust laws."

Industry leaders, taking a cue as to the point people behind the inspec-

tion by noting between the lines of the order, agree that it is a tight-woven, carefully worded and carefully thought-out document that would force the Board to narrow the almost limitless scope of investigation the order grants. The order is backed by the common support of all the five Board members.

In their consultation, however, several representatives of the Board agree that the order might be useful both in its philosophy that could lead, but not to impose the inspection and review with a "police action." A key to the rest of the order which calls for an inspection of all records of ATA and its members "including but not limited to financial, statistical and operating data" is the word "records." It is not a search of the "past" but of the "present."

At least one Board member said he declines the word "records" with the inspection which would mean the inspection of all records of the carrier's operations behind such an action.

Some industry members fear that the order that a real purpose behind the inspection is to determine the strength of the ATA's position in relation to its members. In this case, the order is in the nature of the order that a general inspection and review "which is intended to determine whether the Board should continue its support of the ATA, and if so, whether the Board should impose further conditions to support it."

The order instructs that the ATA "planned an active plan as the congressional hearings which led to the passage of the Civil Aeronautics Act of 1958." However, it emphasizes that the association activities have grown in size and "strength of area covered."

This suggestion of biggest room throughout the order and serves as a basis for the conclusion on the part of many observers that the CAB probe can be a direct attack on the ATA.

However, the Board's order also places emphasis upon the dues and contributions of member carriers paid to the ATA. In this connection, the Board states that "but not knowledge of the specific contributions and contributions upon each member under the formula" for providing dues. It adds:

"The dues as paid are calculated to cover the actual expenses of the association. The formula is processed upon the amount of assets to be paid under

the association's budget, and the Board has sufficient information concerning this budget."

The order also suggests the Board will probe into the influence the huge multimillion dollar in ATA affairs. It adds that ATA membership includes the "heads of corporate concerns, including the local, state and national executives" but also that the "core of the current membership" is composed of those individuals which formed the ATA in 1938.

Later the order has to take on the influence of large airlines on the ATA.

"Therefore, it is appropriate for the Board to determine to what extent, if any, the large carriers control the affairs of all carriers through the membership of the ATA."

The order contains a show cause clause which permits interested parties objecting to a final Board order for the inspection to file a statement and other material supporting their objections with the Board by May 30.

Hughes Asks Approval Of TWA Lease Plan

Washington—Hughes Tool Co. has applied to the Civil Aeronautics Board to lease Boeing 707s and will open parts of the air network from the New Orleans. Hughes Tool holds the majority stock in TWA.

Specifically, Hughes has asked the Board to modify its acquisition and control order of 1964 to allow any applications on leased transactions with the airline. The memorandum said it has 14 Boeing 707-131s on order at a cost of \$4.7 million per aircraft and that, while TWA has made no specific commitment to acquire additional planes but for the jet itself to be made available to the airline.

First of the new jets has been received by Hughes and delivered to TWA under a dry-lease lease arrangement approved by CAB last month. Hughes told the Board it expects to deliver 11 more Boeing jets to the airline under the same leasing arrangement at a cost of \$1,950 a day. The leasing agreement, as reported in *ENR* by June 30 of this year and are subject to termination by either party upon 24-hr. written notice, the memorandum said.

Stock gaps for the jets also have been approved for sale to TWA at Hughes previous offer. The company said the jets would be sold to the airline as needed with a limitation of \$1.5 million on the total sale price. Hughes also said it plans to deliver 10 spare engines to the airline under a lease arrangement similar to that on the aircraft.

CAB Opens Hearings on PanAm 707 Atlantic Dive; Crew Testifies

By Robert I. Stanfield

New York—Several contributing factors to the 29,000-ft., 400-ft.-plus dive of a Pan American World Airways Boeing 707-131 jet transport over the Atlantic Ocean on night of Feb. 3 were pointed out during two days of Civil Aeronautics Board depositions taken at the Federal Building at New York's Midtown Airport May 18 and 19.

Depositions were held in April 1 at Boeing's Arlington, Va., headquarters in Seattle, Wash., and at the company's Renton Wash. plant. More will be taken April 6 in Los Angeles during testimony with personnel of Lockheed Aircraft Service and Federal Aviation Agency.

Aircraft N7012PA was at 35,000 ft. flying from London to Canada, New, (unpublished), perished at 32.5 deg. N., 40.7 deg. W., when it disappeared at approximately 2200 Greenwich Mean Time. At that time, altitude on transponder was 5,000, cruise speed was Mach 82, gross weight was between 190,000 and 200,000 lb. The 707 was pulled out of 6,000 ft., following which it was flown manually and landed at Canada (AW Feb. 9, p. 38).

Depositions taken by a four-man CAB board headed by Vice R. O'Brien, Bureau of Safety, brought out the following:

• **Autopilot control.** Crew was not alerted when aircraft was on its final PB-20D autopilot just prior to the dive. No warning light, signaling a disconnect had been set, and the autopilot was not disengaged until 10 min. after the dive. During descent, wind fell from 200 to 100 mph. Operation of the autopilot was normal during descent, which later made at Canada. Warning light was found in fielding position, several hours after aircraft was flown.

During two previous flights the autopilot had malfunctioned, causing a near-panic in the cockpit. In one instance, disconnection following an altitude 16,000 ft. was not detected by the crew. William King, Pan Am's engineering supervisor, stated that prior to this incident very few disconnections had been reported without the warning light coming on.

Three days following this incident on Feb. 6, during a flight of more than 10,000 miles, another disconnection, with no warning light, was reported, prior to which 707-131 had 4,000 ft. of altitude heading. Knowledge was brought to the company headquarters in Seattle, Wash., by check of the aircraft log book. Studies are now underway by Boeing Aircraft Co., in which Pan Am's own is coordinating, and reviewing warning

light indicators and controls so as to avoid occurrences of this nature.

• **Flight recorder.** Device, which logs aircraft performance, had been removed from the 707-131 left wheel well at Canada, prior to inspection by Federal Aviation Agency, officials. King stated that the recorder, disconnected by Lockheed Aircraft Service and months ago for 12.5 hr. at flight, had not cut off tape previous to this flight. Capt. Kenneth A. Smith, chief pilot of Pan Am's Atlanta Division, said the tape had run out Jan. 27.

• **Emergency equipment.** Only about half the oxygen masks opened following activation from the cockpit, according to a report submitted by the aircraft commander, Capt. W. W. Lewis, assistant vice president for commercial operations of Pan American.

W. Lewis, senior pilot, said that several oxygen masks missing from the aircraft were not checked. King, checking availability of emergency equipment was left questionable. Finding of possible oxygen bottles also created some difficulty in this department and use.

Following are excerpts from statements made by the crew, after the accident, and which were presented to the CAB:

• **Capt. W. W. Lewis.** Stopping in the plane to talk with Norman Ellis, vice president of the Atlanta Division, Lewis noted an increase in turbulence near level, plus increase in positive G forces. "I noticed motion on left side of fuselage, and the airplane was off into sharp right downward turn. Power was still at cruise thrust. Lewis, who made his way to the cockpit, pulled power levers and descended the plane.

The 707 became badly banked. Air speed was past 400 kts. as the aircraft came out into the turbulence. Altitude closed rapidly, passing through 17,000 ft. Electric trim button was inoperative.

• **Capt. Kenneth Smith.** "Got major leg, positive G forces rolled. Added throttle (flight engineer George Smith) to pull airplane up to level. Smith's immediate command: 'Heavy pressure and banking at 4,800 ft.' ... started into sharp climb, speeded falling back to 195 kts. ... Wings level in moderate climb at 8,000 ft. and accelerated to 270 kts."

Smith noted that engine responded well, with heavy right rudder necessary to hold it straight. Operating the air brake by hand, cut out rudder was "on."



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Airline Traffic—January, 1959

	Domestic Passengers	Domestic Passenger Miles (DPM)	Load Factor %	D. Mail	Express	Flight	Total Passenger Miles	% Domestic Traffic
DOMESTIC TRAFFIC								
American	340,379	221,814	81.9	1,142,424	342,001	4,744,793	24,662,791	55.9
Boeing	192,110	70,434	67.2	408,494	315,741	761,770	10,978,719	36.6
Capital	122,450	148,493	64.2	49,327	222,813	339,476	14,320,989	22.1
Continental	79,415	446,791	67.1	194,412	42,373	131,906	4,742,464	13.4
Delta	201,006	156,163	66.9	450,743	347,434	1,318,136	14,948,178	54.0
Eastern	272,170	276,340	64.7	665,796	447,831	1,311,471	17,794,345	43.1
Northwest	161,641	117,273	67.3	220,442	65,128	422,722	10,496,739	48.3
Southwest	93,491	47,597	57.6	76,341	10,830	161,740	4,767,484	44.6
Northland	128,439	119,261	64.9	54,746	246,876	114,347	14,966,006	46.3
Trans World	470,811	375,640	77.0	1,475,242	772,149	2,304,213	40,328,881	64.0
United	344,370	437,777	67.9	1,478,131	1,076,761	6,344,275	31,376,801	66.6
Western	117,527	46,953	66.4	197,334	72,334	314,069	7,461,809	47.5
INTERNATIONAL								
American	5,440	4,684	65.9	7,091	127	127,128	643,403	47.9
Boeing	2,410	4,491	61.9	18,319		104,416	657,964	36.4
Continental & Alaska	27,049	1,811	62.2	5,413		4,993	386,191	69.7
Delta	4,686	5,181	66.9	6,427		34,492	621,500	42.3
Eastern	26,812	39,894	69.18	10,107		161,646	4,344,640	64.71
Northwest	4,635	5,234	66.1	6,338	2,970	34,668	389,842	40.0
Southwest	12,734	25,897	66.7	1,167,416	19,184	661,107	4,401,497	66.4
Trans American	3,676	3,644	64.0	26,942		773,292	499,116	40.1
Alaska	74,192	102,360	69.1	1,346,585		2,317,412	14,866,072	36.4
Latin America	175,339	128,321	69.4	194,464		14,866,450	14,866,450	100.0
Pacific	26,363	40,204	77.2	1,372,418		1,703,743	18,358,442	68.9
Panama	10,411	11,149	63.4	47,447		464,267	1,171,126	66.0
Panama								
Trans World	26,361	30,807	62.4	706,182		1,821,126	16,913,729	66.4
UNION								
United	7,343	11,428	57.9	126,171		47,453	9,861,646	64.7
Western	5,830	4,116	76.1	5,264		21,911	666,689	78.9
LOCAL SERVICE								
Airphoto	10,341	2,764	62.3	15,191	11,498	16,775	944,473	63.4
Boeing	16,142	3,816	60.7	4,083	2,244	4,117	383,322	47.1
Central	12,176	3,472	59.8	4,124	1,369	2,415	326,273	26.7
Frontier	18,302	2,044	42.8	19,205	1,199	45,436	968,446	53.6
Isle Central*								
Network	41,790	9,340	66.9	11,244	11,720	11,710	807,320	66.4
North Central	26,262	9,793	66.4	9,961	11,901	11,901	1,008,480	47.1
Delta	10,043	4,126	46.6	9,791	9,394	9,394	400,416	46.6
Pacific	90,236	4,611	46.6	11,129	4,712	7,202	670,770	46.3
Portland	28,721	2,478	60.3	11,114	3,719	11,114	323,281	40.4
Aviation	19,313	3,260	59.9	9,499	6,964	10,119	374,367	27.7
Trans World	17,367	2,048	62.7	15,689	10,070	24,027	541,056	46.6
Wind Coast	15,364	4,467	61.1	5,537	3,122	2,719	409,893	46.4
HAWAIIAN								
Boeing	10,473	4,794	57.3	6,767		184,797	499,185	37.9
Alaska Airlines	11,851	1,706	63.1	700		2,795	149,381	59.4
CAROL LINES								
Airco								
American & Alaska*	1,708	4,855	146.6	46,670	77,421	10,344,026	11,594,460	91.1
Florida Tiers								
Kidde	587	472	146.0	33,793		5,397,976	2,764,428	26.9
Southwest & Western	2,313	20,391	93.22				6,991,046	94.71
MICROCENTER LINES								
Chicago Helicopters	8,810	140	59.9	803			18,711	59.5
Los Angeles Airways	1,841	72	68.4	3,436	1,953		19,146	52.2
New York Airways	4,555	143	47.6	3,037	1,204	204	14,492	49.9
ALASKA LINES								
Alaska Airlines	2,304	5,072	66.1	17,381	4,204	191,793	576,418	26.9
Alaska Coastal	2,376	2,993	59.2	2,940		2,012	26,320	46.6
Centine	123	126	62.2	2,311		46,1107	44,152	47.9
Delta	5,934	126	65.7	2,072		1,891	19,998	47.9
Northwest Consolidated	1,343	421	34.4	15,611		24,722	191,221	39.9
Pacific Northwest	7,464	4,644	62.2	10,841	4,808	191,001	4,911,486	32.2
Northwest	803	574	59.5	21,428		11,711	176,968	59.6
Winn Alaska	2,924	278	9.9	10,140		212,711	342,497	37.9

* Not available.
Compiled by Aviation Week from airline reports to the Civil Aeronautics Board.

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SHORTLINES

► **Ala Fusion** reports 2,517,371 passengers flown, 2,184,210,000 passenger miles during 1958, a 26% passenger mile increase over 1957. Also during 1958, 19,763 short lines air miles were covered, a 7% increase over 1957. Ala Transit and British Foreign Airways have entered into an agreement by which passengers may use tickets issued in one airline to travel on the other at the latter's schedule at some convenient.

► **Boeing Airlines** has signed contracts with five major U. S. oil companies to supply the correct jet fuel for its fleet of Lockheed Electra and Boeing 737s. Companies are The Texas Co., Esso, Standard Oil Co., Phillips Petroleum Co., Humble Oil Co. and Continental Oil Co.

► **Civil Aeronautics Board** has awarded the foreign air carrier permit issued to the Cuban carrier, Aerovías "D." S. A., to include Fort Lauderdale, Fla., as a terminal point with West Palm Beach on the carrier's flight from Havana.

► **Flying Tiger Line** reports to Civil Aeronautics Board show the carrier to be the nation's largest in flight hours with 104,875,482 flight hours miles flown in 1958.

► **Kaiser Transportation Co., S. A.**, has been authorized by the Civil Aeronautics Board to hold a transport permit as carrier permit to transport persons from Miami to a point, or points, in Cuba. Duration of permit is five years.

► **Lockheed Aircraft Corp.** is scheduled to deliver 312 Electra turboprop jet craft valued at more than \$350 million during 1958, according to an announcement by Lockheed board chairman Robert E. Gross.

► **Omni Air Lines** will increase its operations from 17,599 net per day on May 1 to 25,598 net per day, with the inauguration of five new routes and reduction in four routes previously served as authorized by the Civil Aeronautics Board in the Seven State Anti-Cow.

► **Trans World Airlines** will begin the first Chicago-London nonstop service on June 5 using Lockheed 354H Constellation equipment. The airline also announced it will resume Chicago-Paris nonstop service on May 2 with weekly service. On April 29, TWA's will operate a weekly flight from O'Hare Field, Chicago, to Detroit, Shannon, Paris, Milan, Rome and Athens.

AIRLINE OBSERVER

► Domestic trunkline business took a sharp upturn in February when average passenger miles rose 11.4% above the previous February total in comparison with a 9% decline in January and a 13.1% drop in December. Although available seat miles jumped 4% in February as compared with the same month of last year, load factor for the domestic trunkline industry moved to 58% from 56% in February, 1958. The slight increase was the sixth monthly load factor increase recorded in the past two years.

► **Stark Airlines** is talking across possibilities with several companies, none of which are current. The cargo airline, which last year was awarded authority by the Civil Aeronautics Board to transport its operating certificate temporarily (AW June 30, p. 26), is looking for a cargo partner that would be an acquisition rather than a sale. If a merger is completed, Stark can carry heavier loads for its purposes.

► At least one more airline will permit its pilots to decide mutually whether a date or hour may well require frequent transfers. Plans call for the one of the selected companies to have a six-month experimental period after which a permanent agreement on the issue will be negotiated between the company and the pilots.

► **El Al** Israeli Airlines may be forced by the Israeli government to abandon its transatlantic routes and stop plans to develop routes in Asia and South America. Loss of traffic to the carrier because of its Arab air transport boycott in the Near East and a deadlock with Britain over the question of increasing service beyond London to the U. S. are causing the government to consider modifying the carrier's operations to European routes only.

► **Continental Air Lines** is filing a bid similar to Western Air Lines' request for a route from San Francisco and Los Angeles to Honolulu and Hilo. In its application to the Civil Aeronautics Board for the route, Western said it would operate the route with Lockheed Electra turboprop transports. Continental would use Boeing 707-120s as alternate 707-120B.

► **Aloua Airlines** plan to begin operating three Fairchild F-27 turboprop transports on its interisland routes in June. The move will help close the competitive gap created when Hawaiian Airlines bought its Douglas DC-3s. Viewpoint was secured with Convair 440s in cooperation against Aloua's fleet of DC-3s. Aloua purchased the three planes with government-guaranteed loans underwritten by Continental Airlines and United States Life Insurance companies.

► **Russia's** 108-passenger Tu-116 turboprop transport, which crashed from public view without any explanation almost a year ago, is back again on paper, at least. One of a series of five new postage stamp depicting modern Soviet airline transports features the Tu-116. Other stamps show the Ilyushin, Tu-104, Tu-114 and the B-12. It seems unlikely that the 500-kgp Tu-116 stamp would be issued if the Tu-116 were not destined to appear on the Russian civil aviation scene.

► U. S. delegation to Rio de Janeiro conference on line structure on South American routes, headed by Civil Aeronautics Board Vice Chairman Chase Gentry (see p. 48), took this stand on government control over international routes: The aeronautical authorities should look to the carrier themselves as the primary instrument for establishing and maintaining, subject to government approval, the highly complex structure of international lines and rates as a means of maintaining the use of transportation facilities in this connection.

► **Chance Vought** has contracted with Convair to build eight compartment units for the Convair 580 turboprop transport. The order is Chance Vought's first commercial airline subcontract since it began producing aircraft in 1917.

► **Pan American World Airways** Boeing 707-130 turboprop transport operations has brought about a 47% increase in transatlantic travel during the first nine weeks of this year as compared with the same period of last year. All other scheduled transatlantic carriers showed an 11% increase in European travel during the same period.



NO MONDAY MORNING QUARTERBACK



Good management, like a good quarterback, calls the right signals during the game and sets on Monday morning. In the field of aviation and space, management must also call the right signals now for a game that won't be played for years to come.

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IRISH AIR LINES has announced plans to buy three Boeing 720s. Orders are not final.

Irish Air Lines Planning Nonstop Transatlantic Flights for 720s

New York-Irish Air Lines plans to get transatlantic nonstop performance from the intermediate-range Boeing 720, the carrier's announced choice of jet equipment. Manufacturers would like the 720 to maintain its gross weight for the first foreign customer.

The airline, which began transferring its service last April with leased Seaboard and Western Lockheed Super G Constellation (AW) 40s, p. 41), has not placed a firm order for the 720 but has announced plans to buy three. Financing has not been completed.

Value of the proposed order is \$14.15 million, including \$12 million for the aircraft and the rest for spares and replacement. American Airlines has ordered 25 of the 720s and United Air Lines has ordered 11. The American carrier's 720s will serve shorter routes and American goes to their suppliers will be \$13,000 to \$14,000 apiece. First Irish Air Lines 720s with tailgates increased from 11,000 to 13,000 gal capacity, will be able to operate at a 217,000 lb. takeoff maximum.

With loaded-up landing gear and some powerful engines, gross weight of the version of the 720 will go up to 221,000 lb. Boeing said. The improved Pratt & Whitney JT8C-7 engines each with 1,900 lb. static thrust, less than the initial units, will be available in 1962, according to the airline.

Delivery date was one factor in selecting the 720, general manager Joe Smith. P. Dempsey, Irish Air Lines vice president, said the airline expects to get its first 720 in November, 1961, with the other two arriving in February and March, 1962. The lease with Seaboard and Western runs through 1960. Seaboard has asked Civil Aeronautics

Board for permission to buy up to 35% of the Irish airline's stock, but the matter is still before the board.

Dempsey and Smith had commented that the 720 could fly nonstop in both directions in New York-Shannon service. The jets will be operated in mixed service: probably 100 non-stop and 20 short class seats.

The airplane also could be used on other Irish Air Lines routes to Europe, according to Dempsey. The carrier has been operating Viking Viscounts for several years and recently added Fokker F-27 Translantic turboprops to its fleet. With delivery of the 720s the fleet would be doubling.

Irish Air Lines has traffic rights at Chicago, but no plans for expansion of its U.S. service in the immediate future, Dempsey said. It currently serves New York and Boston. Both routes will be expanded with service to Copenhagen next month and to London in June, according to Dempsey and these three will be "a month" to complete.

The 720 has a lower price tag than the larger 707-120 now being the Air Line for Pan American World Airways. Price of the 720 is about \$5 million. American Airlines says its 720s cost about \$5.2 million without engines, and estimated the cost of engines for the plane at \$1,600,000 each. Actual cost, however, is leaving the engine.

Boeing's W. Jerome Kay, manager of export sales, transport division, told American World Air company, hopes to sell the 720 in carrier operating South Atlantic service such as the 2,610 and on route between Dakar and Nouakchott. New York distance is about 2,700 mi. on

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MISSILE ENGINEERING

Pershing to Test Industry's Missile Role

By Evert Clark

Plattsville, Ala.—Army-Marine Pershing 150-718 on missile is the first large ballistic system for which Army has entrusted a major part of development to a contractor.

The approach differs from that used in the Redstone and Jupiter intercontinental Army laboratories, assisted by Chrysler Corp., around the outside of the way through prototype production before coming the finished end. The difference, however, is only one of degree and not of principle, according to the Army Ordnance Missile Command.

Enlarged Role

Nevertheless, the solid-propellant Pershing marks the beginning of an enlarged role for industry in the creation of large Army missile systems. Pershing represents a middle ground between the Nike family—developed almost entirely out of house, under Army supervision—and the Redstone and Jupiter, which Army considers to be almost wholly in-house developments.

For this reason, the missile command does not look on Pershing as a radical departure from its usual in-house team approach to weapon system development, but rather as a modification of the procedure used in having the early ballistic systems now being

based more on Redstone and to a lesser degree, Jupiter, were carried on for into their life cycle by Army laboratories as a continuation by the Army that it had more responsibility for this type of work than it could find in industry in the early days of missile

Development Cycle

First indication within the Department of the Army that missiles would become a principal weapon in the Army arsenal came around 1949. In 1950 and 1951, Army says it had a difficult time finding contractors which it considered both capable and interested. The latter group Corporeality was under way, and development of the missile market Little John was just beginning.

But the group with the greater knowledge in ballistic missile development at that time was the nucleus of German scientists and engineers who came to this country from Plattsburg, home of the W-2 missile at the end of World War II.

Within two or three years, the per-

PERSHING MISSILE DEVELOPMENT GOVERNMENT—CONTRACTOR STRUCTURE

GOVERNMENT SUPERVISOR	GOVERNMENT ENGINEER	CONTRACTOR & SUBCONTRACTOR	S. S. ENGINEER	CONTRACTOR S.S.
PERFORMING SUPERVISOR	AFMA	ARMY	AFMA	PERFORMING SUPERVISOR
ENGINEERING RESPONSIBILITY	NAFMA	NAFMA	AFMA	PERFORMING SUPERVISOR (AFMA)
ENGINEERING SUPERVISOR	NAFMA	NAFMA	AFMA (AFMA)	PERFORMING SUPERVISOR (AFMA)
S. S. SUPERVISOR	NAFMA	NAFMA	NAFMA (AFMA)	PERFORMING SUPERVISOR (AFMA)

PERSHING SYSTEM SUPPORT EQUIPMENT DEVELOPMENT

GOVERNMENT SUPERVISOR	GOVERNMENT ENGINEER	CONTRACTOR & SUBCONTRACTOR	CONTRACTOR & SUBCONTRACTOR	CONTRACTOR & SUBCONTRACTOR	CONTRACTOR & SUBCONTRACTOR	CONTRACTOR & SUBCONTRACTOR
TECH. ENG. SUPERVISOR	AFMA	AFMA	AFMA	AFMA (AFMA)	AFMA (AFMA)	AFMA (AFMA)
ENGINEERING RESPONSIBILITY	NAFMA	NAFMA	NAFMA	NAFMA (AFMA)	NAFMA (AFMA)	NAFMA (AFMA)
ENGINEERING SUPERVISOR	NAFMA	NAFMA	NAFMA	NAFMA (AFMA)	NAFMA (AFMA)	NAFMA (AFMA)
S. S. SUPERVISOR	NAFMA	NAFMA	NAFMA	NAFMA (AFMA)	NAFMA (AFMA)	NAFMA (AFMA)

son with respect to industry had begun to be received, particularly so far as interest in missile contracting was concerned. But, by then, the German team led by Dr. Wernher von Braun had been brought to Redstone Arsenal and work was well begun because the Redstone missile was well along.

The German team demonstrated its capability of taking a missile through all stages from concept to prototype production. Along with this ability, its high complexity in the missile program stage was the fact that the German scientists were Army civilian employees, which added to the administrative, legal and financial problems of dealing with contractors.

By the time Jupiter development was ordered, industry had what the

Army felt was sufficient capability, but Jupiter presented a new problem of top priority—cost development. Time was an important factor in the decision to develop Jupiter before the Army, even though Chrysler is given a large part in development day it had with Redstone.

Industry-Army Future

A close relationship between contractors and Army's Ballistic Missile Agency, which oversees development of large missiles for the command, will depend upon several conditions.

How well the Army-Marine relationship works out in the Pershing system. When Marine's Orlando, Fla. division was chosen as prime contractor only last year, Army officials de-

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tion. Arma! has technical supervision and engineering design responsibility with Martin leading engineering design responsibility for compatibility of the air with the overall system. Precision and the Diamond Ordnance-Fuzing Laboratory will handle design effort jointly. Ultimately, this and the R&D manufacturing will be turned over to Ballou Research and Development Laboratories, Inc., and the York Division of Boeing.

• **Weapon.** Atomic Range Corporation and Spauld Corp. will lead and develop let. Coordination with Boeing is being handled by ARMA and Precision.

Ground Support Equipment

On ground support equipment, ARMA, shows technical supervision with Corps of Engineers for the ground power pack, Signal Corps for the main maintenance park and Ordnance Transportation Automotive Command for plane movers. All prime movers will be government furnished equipment.

Responsibility, regardless for the major ground force is:
• **Transportation-maintenance.** Technical supervision by ARMA, design responsibility by Martin, design effort and R&D manufacturing by Thompson Products.
• **Automotive handling equipment.** Technical supervision by ARMA, design responsibility by ARMA and Martin, design effort and R&D manufacturing by Martin and Boeing.

• **Fire control pack.** Technical supervision by ARMA, design responsibility by ARMA and Martin and design effort and R&D manufacturing by Martin and others.
• **General power pack.** Design responsibility and effort by Engineering Research and Development Laboratories and Martin and R&D manufacturing by Martin.

• **Communications pack.** Signal Corps' research and development laboratories and Martin share design responsibility, but design effort and R&D manufacturing are in the latter.
• **Power sources.** Ordnance Transportation Automotive Command holds design responsibility, as well as technical supervision. Design effort and R&D manufacturing will be done by Ford Motor and General Corp. and Pacific Car & Foundry.

The division of responsibility between Arma and Martin continues over to the handling vehicle, for which the lead is being shared by Air Force Missile Test Center's Corps Command. For example, Construction work will be supervised by Corps of Engineers. Martin will build the three-level storage structure to an ARMA design. The design will be an ARMA-Martin team, with ARMA leading Martin in

design and engineering. As the program advances, the ARMA team will withdraw, leaving design duty to troops but retaining technical supervision over all design. ARMA's Missile Fuzing Laboratory will be responsible for telemetry and data contributions during the research and development tests.

Martin helps from 20 to 100 percent at a time in the laboratories of ARMA's Development Operations Division, learning from ARMA personnel an implementing ARMA's laboratory work.

Martin has come into the Army holding a similar picture at a significant time—when Army is stressing both close cooperation with the contractor and contractor reliability. The Missile Command is making a greater attempt than ever to have contractors share in preplanning and programming, telling the contractors what it expects will be the maximum capacity as design progresses to give them a lead for what it will need in tooling, subcontractor structure, etc., and to help him improve production techniques.

It also is demanding more of the contractor, and that is where the stress on reliability comes in. All these issues have explored and expanded the cost of reliability but Arma appears to be paying even more emphasis again at than the others. Along with its burden of being a "hot cash" as Army contractor relations, Martin will be the first contractor to develop a major Army missile system under the glare of the reliability spotlight.

Mr. Gen. John B. Mohr, head of the Missile Command, made it clear that this will be no easy task when he told an AGMC contractor meet:

"In the early days of development of our guided missile systems, there were major unknowns, we did not know whether some of the ideas for these new weapons were even feasible."

"Consequently, we asked contractors who had a demonstrated capability in related fields and turned over to them development responsibility for development. Some contractors went one way, others went another. The results were not uniformly good. Some achieved more than others. In many programs, large sums of money were required for 'fail' or 'when-the-chance' effort, to salvage the system by engineering effort. These efforts are now continuing, still in schedule consciousness and cost at levels of hundreds of millions."

"It is clear now that command has achieved an in-house capability which has demonstrated that it is stored to meet. It is with this capability that we are applying this greater emphasis on a more uniform, aggressive and reliable reliability program. I believe that our approach is sound, and that it will result in higher reliability, fewer delays and ultimately, in greatly reduced costs."

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Among the many important jobs now being assigned to the LOP-30 in the aircraft and missile fields are: wind tunnel and flight test data reduction, production system design, transducer calibration, flutter and vibration studies, payload research, trajectory studies, component reliability evaluations, speed of response calculations, thermal stress distribution. For further information and specifications, write Royal McDev Corporation, Data Processing Division, Pearl Street, New York 10, New York 10, New York 10, New York 10, 175 Barclay Street, Toronto 16.

ROYAL McDEV *data processing division



FIRST FLIGHT photo of the prototype BB-152 shows bicycle landing gear with a two-wheel bogie forward and a four-wheel bogie aft.

East Germans Plan BB-152 Export Drive

Leipzig—East Germany is beginning a driving commercial drive to produce and export its Dornier BB-152 four-turboprop transport although one of two prototype planes is reported to have crashed at Dresden, Mar. 4.

Plans are now in production, with an aircraft scheduled for delivery in 1960 and 15 in 1961.

East German authorities were silent last week about the crash at Dresden and there was no official confirmation that the aircraft was the BB-152 as is widely believed here.

Prof. Rolf Bode, designer of the aircraft, would say nothing other than that the crash "was not caused by structural defects." He said the reason re-

marking the accident would come "in a few days" after investigations.

Two prototypes of the BB-152 have already been built, it was learned, and first flight was made in December of last year. The first model had an under-bicycle landing gear with wingtip stabilizing wheels, but this design has now been changed to a tricycle arrangement with side wheels located in the rear of the twin engine pods (AW Nov. 21, p. 49).

Officials of the VEB Flugzeugwerke (roughly equivalent to the Aircraft Division) refused comment on orders, prospective customers, delivery times and prices when queried at the

Leipzig Plant. "We are confident of plans of business," said one official, "but to give out such details would put ourselves at the mercy of our competitors."

Export deliveries are to start next year, and the Eastern Deutsche Luftarmee will start service with the plane at the same time.

East Germans at the fair appeared sure that they had a winner, since the BB-152 fits a gap in the existing world range of jet planes. They regard Sud Aviation's Caravelle as the only real plane in its class, and feel they have an edge over it on passenger-miles per dollar.

In addition, they claim there will be

no competition within the Communist bloc. Joint economic planning and industrial division of labor have established Russia as the sole producer of large jet transports with Czechoslovakia concentrating on jet-engineered aircraft.

Then East Germany has a monopoly in its own field with many potential customers among allied states.

Standard BB-152 is a 57-passenger four-engine turboprop aircraft. Its specifications have been altered since details of the plane were revealed at the 1958 Leipzig Fair (AW Mar. 24, 1958, p. 32). The single-shaft engine has a 11 stage axial compressor, a combustion chamber containing annular and single combustors and a two-stage axial turbine followed by a fixed nozzle.

Maximum dimensions are: span 99 ft., length 105 ft. and height 29.5 ft. Normal takeoff weight of the standard type with 15,850 lb. payload and 31,500 lb. of fuel is 95,700 lb.

Maximum speed is stated to be 572 mph at 15,750 ft. Cruising speed is 495 mph and landing speed 134 mph (calculated on a 3,300 ft. runway) and landing rate is 2,200 ft. at 77,500 lb. landing weight.

The aircraft duplex at Leipzig is based on a 10,000 sq ft. position and includes a mockup fuselage of the 57-passenger version, and one of the plane's Puma 114 engines of 6,950 hp. thrust, with separate exhibits of the compressor, turbine and combustion chamber.

Interior of the fuselage is finished in gray with strip lights extending the full length of the cabin (AW Mar. 21, p. 41). Design of the seat (two rows of two and three) showed considerable attention to weight saving and passenger comfort.

Seats weigh 24 lb. each and have large silver frames with foam rubber cushioning.

Molded backrests are fully adjustable, and padded armrests on the sides pivot upward for ease of entry.

Side-hatch air is controlled in approved compartments at the base of the backrests. "In strict operation who doesn't require hats" is an official explanation, perhaps alluding to the Russian airline. Emergency oxygen masks are contained in fabric-covered recesses in the top area of each seat with flow indicators at the bottom.

Reading lamps are also placed on the seat back—beside sleeping in passenger mode. Window procedure is used instead of plastic windows. "We're lost it in Dresden—very cheap," said the official.

The prototype value of this investment is key to establishing the greater weight, placement cost and for sale in the event of leakage in bad weather. Fundamental too, are the glass-tipped tailfin and the use of heavy



BB-152 is tested at destination at Dresden. Mass production, tested at Dresden.



Mockup of BB-152 is displayed at Leipzig (above). The 57-passenger version is below.



BB-152 transport began takeoff run on first flight from Dresden, August. Note prototype's nose windows and outboard gear.

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physical and block board for fitting into sets and doors.

While the main production plant is at Dayton, the engines are designed at Press and built at Ludwigsfeld. Since East Germaners formerly accounted for 65% of the country's aircraft production, it is believed that the German Democratic Republic is well placed for skilled manpower and manpower in calculating the requirements of jet planes.

Facilities are limited, however, and the East German engine is destined to import from the West wherever it can. The use of semi-finished materials, components, instruments and accessories. According to the potential market, many of these parts are produced in a variety of countries. These include Austria and Poland, James Booth, East German, E. M. I. Electronics, France, High Duty Motors, Nigeria, Soviet Union, Russia, Thomas & Baldwin, Royal, Swiss Motor Union, St. George Godfrey & Partners, South Africa, and South-Central Europe.

The use of Western components in the RB-152 would greatly ease servicing problems when the plane is sold to non-Congress countries as it is intended.

Edward Brothers hopes to sell what these components, engine, valves, systems and radio and navigation aid systems. It is believed with the use of these components in the market for radio and navigation equipment.

Clark, Kern and Northside has at least received in order for initial production.

Brooks was asked about strategic situations as each export enters the East German. He answered that East German could not consider the use of equally strategic items—advanced engine, tools, for instance. Thus, he believes both sides would have a vested interest in maintaining relations and "not allowing them to change."

Brooks also made some comments as the design of the RB-152. Comments



PROF. BEISWILER BLAIDE, designer of the RB-152, attended the Leipzig Fair.



TYPE 204 propeller for the RB-152 delivers 6,500 hp thrust. The propellers are mounted on pins under each side of the transport wing.



SINGLE-SHAFT engine has a 12-stage axial compressor, a combustion chamber containing simple and single chambers, and a two-stage axial turbine followed by a free turbine.

to Russia and British parties, he found added engine design because it doesn't disturb the wing area and thrust power, increases for radio supplies engine servicing and replacement and reduces engine noise.

The engine is compensated for by the smaller wing required and by lower losses in shorter tailpipes.

As for performance, he stated that the 17-dkg engine had been in the air since March 55 in the Soviet Union at Dresden (which reportedly has two tanks) low speed—175 mph and high speed—Mach 1.8. He added he believed that the RB-152 engine, presently rated at 6,500 hp thrust, was capable of development to 7,700 hp. Further, the RB-152 would take off and land at 95% of the world's airports and at 75% of those on their range routes with help fuel loads.

Brooks told Aviation Week that the RB-152 was an economic cost a prototype. He gave several reasons for building a commercial jet in a country where production of most capital equipment and consumer goods falls below the world needs.

- Building aircraft provides excellent situation for problems arising in other branches of industry by putting advanced equipment on ships, steel and other materials and bringing more rapid development in quality.
- For East Germany, poor as our markets, it is considerably advantageous to export products with the highest labor in weight ratio.
- There is a large potential world demand for medium range jets, and the

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Germans Sign Contract For Fiat G.91 Fighters

Bonn—West German Defense Ministry has signed contracts for purchase and construction of Fiat G.91 jet fighters. Contract provides for purchase of 50 with another 150 to be built under license (AW Feb. 16, p. 3).



New aerodynamic design, radar, armament and engine details of the Soviet twin turbojet Badger medium bomber are shown in three pictures taken on operational missions of the Red Air Force in Russia. Low level flight view of Badger formation shows details of Soviet bomber design including double wing fences, tail pipe lining of jet engines to deflect heat blast from fuselage and tail, radio-controlled tail gun turret, VHF and ultrasonic on upper fuselage and lower fuselage before the horizontal stabilizer, probably used for long range communications, and radio side blaster pod under the stabilizer. Note the large "tail" type ventral fin and the fixed landing gear housing Badger sits on the wing trailing edge.

Soviet Badger Bomber in Operational Closeup

Squadron of Soviet twin turbojet Badger bombers parked on battlefield in the USSR. Note the fuselage intake louvers just forward of jet engine air intakes and the twin 20 mm cannon remote-controlled turret on top of the fuselage, one of the three distinctive armament installations on Badger. This view shows tapering thickness of the sharply swept wing and details of wing fences.



Takeoff photo of Badger shows four shielded bogies of main landing gear that retract inward into wing fairings and double shielded nose gear with wheel well doors open. Note large doorways or intakes for the 75,000 lb thrust turbojet engines and the prominent intake of the wing.



Closeup of the Badger while taxing down a runway (above) shows details of the bomb aimer nose and cockpit with glass horizontal navigation windows just forward of constantly operated twin 20 mm gun turret. Note landing salience protruding from fuselage belly just below crew window.

Closeup of Badger from the rear (at right) shows large "tail" type ventral fin and details of the blower radome on side of fuselage under horizontal stabilizer. Note extended tail-dial below fuselage to prevent tail bumping during high angle of attack takeoff runs and radio housing just above tail turret to control arm swing movement. Third twin 20 mm turret is visible on bottom of fuselage forward of the extended tail dial. Note active size of Badger in comparison to standard size of Soviet gray track parked under wing of second Badger at top left.





SIKORSKY S-58 will give Coast Guard close to all-weather capability for search and rescue. Maximum gross weight is 13,500 lb. Weight R1352-44A develops 1,525 shp

Coast Guard to Receive Six S-58s With Nearly All-Weather Capability

Stretford, Conn.—United States Coast Guard, strong at 25 air fleet assets divided between helicopter and fixed wing aircraft, will take delivery during the next two months of six highly advanced Sikorsky S-58 helicopters.

Helicopters, which will be the first Coast Guard aircraft with close to all-weather capability, will give the service a range of 150 miles on its own power. The Coast Guard's present aircraft fleet at Stretford (S-45s) can range 100 miles on its own power for a mission, with little weather capability because of lack of instrumentation.

Coast Guard presently has 127 assets, 75% of which are fixed wing. Transition to S-58s helicopters, 50% airplanes, was advocated by this service after a year-long evaluation of Coast Guard requirements. Recommendations call for an air fleet increase to 145 aircraft, of which 99 would be helicopters.

Program is considered already approved in principle, since the chief plans of it were adopted by the Treasury Department and Congress in 1956. This is the third year in which the early part of the program is being implemented.

The early phase has limited itself to replacement of older aircraft, including R-17s and B-24s.

Timeliness and degree of cooperation

USCGC in pleasure boating and air assistance. The S-58, which can fly 16 passengers (in comparison with the R-17, which can carry 10), has a maximum gross weight of 13,500 lb. Power is supplied by one Wright R1352-44A engine developing 1,525 shp.

The weight of helicopter with armament equipment is 8,331 lb. Auxiliary fuel tank, mounted externally on left side of cabin, holds 150 gal. Cruising speed is 58 kt., maximum, 117 kt.

S-58 Instrumentation

Avionic equipment installed on the S-58, the Coast Guard version of which is one of the most heavily instrumented helicopters ever built, includes the following:

High frequency ARC 35, ARC 45 and Collins VHF ARA-27 UHF; ionos, with VHF remote indicator; 3-41 low-frequency ADE; Taurus R-21 heading fix; search AHN-64 search AHN-18 glide slope; ARN-42 marker beacon; APM-47 ground speed indicator and APM-117 altimeter.

Automatic stabilization equipment (ASE) will allow the pilot to hold a given ground speed from hover up to 50 mph. Pilot also can select the altitude for search preset in ASE and ground speed preset and radar altimeter. Coast Guard now has a 25-ft instrument landing course guide way for its helicopter pilots.

The service will assign five of the six S-58s to its air station in St. Petersburg, Fla., and three to its all-helicopter air detachment in New Orleans, La.



S-58 instrument panel. Rotational rate transmitter and receiver on RF, UHF, VHF bands included on glide slope, marker beacon and wind, with Taurus backup for latter.

French Opinion Split On Mirage IV Bomber

Paris—Proposed to move ahead with a larger Mach 2 version of the Bourrat Mirage IV might benefit some countries, but differences of opinion among French military officials as to whether the project is worthwhile.

Point 40 Whistler J-11 technology is being considered as pre-requisite for the new, powerful Mirage IV (AW Mach 2, p. 51).

Official version of the Bourrat Mirage IV states to make the initial flight next month is powered by two SNECMA 9A turbojet engines, turbojets delivering about 13,500 lb thrust each. This aircraft considered by the French as suitable only as a development vehicle for a larger Mirage version (AW Feb. 9, p. 27) especially weight about 25 tons.

Contrary, the French had planned to power a larger Mirage version with two SNECMA 9A turbojets capable of delivering from 15,000 to 20,000 lb thrust. This Super Mach is still in the development stage. New homecoming French air force thinking appears to favor moving ahead with a larger Mirage IV bomber of some 40 to 45 tons and install two Pratt & Whitney J75. Other proposals also being considered as advanced versions of the Bourrat Mirage and the SNECMA 9A, though apparently the Pratt & Whitney J75 holds the edge.

In any case, it appears that SNECMA's Super Mach development priorities in the big state-owned company is not of the moving, Bourrat version, or will not be held under license, without government commitment to them. SNECMA also is less in trouble overall with the V-1 engine (V-10 engine), and version of Pratt & Whitney J75. French government decision is expected within the next few weeks. It is not yet known how many aircraft French government has in mind.

PRODUCTION BRIEFING

General Electric's Aircraft Auxiliary Engine Dept., Lynn Mass. has received a \$70,000 defense contract for the production of auxiliary speed drive for the McDonnell F-101 fighter. The company's F-101 contract, a fixed-price contract, was total over \$1,000,000. This engine's electrical power is placed on conventional power and cooling system.

Muesenbach-Henry & Co., Register Co., will supply fuel measuring system instruments and fuel tank probes for the Boeing KC-119 jet tankers under \$100,000. Air Force contract.

Little Oxygen Co., division of Union Carbide Corp., will build a liquid oxygen and nitrogen producing plant near Littleton, Mo. Facility, scheduled for completion in 1960, will have a capacity of 100 million cu ft of liquid oxygen and nitrogen per month.

Hawthorn-Denton Division of United Aircraft Corp. will produce engine equipment to test facts, facts being conducted on F-101 aircraft. Results program will include some 1,000 aircraft engine tests.

Craig System, Inc., Lawrence, Mass., will build helicopter portable commo-

nications system for the Army under \$5 million contract. System is part of a \$12.5 million joint contract held by Sikorsky Corp. for the maintenance system for the Army's portable, close-air, battle force.

International Instruments Division of Instrument Systems Co., Inc., New York, N. Y., will supply Coast Guard, with a mobile jet engine, some suspension for clearing ground runway at 10 ft. engines. Part of a Coast Guard contract program, suspension are designed to handle full aircraft power of the Coast Guard F-101 engines.



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Division of United Aircraft Corporation

KELAY DEPARTMENT, Commack, Long Island, N.Y.

Wall Street "Electronics Boom" Sends Ryan Stock to New Highs

New York—Ryan Aeronautical Co. is the latest among a handful of companies to find itself clasped in a sudden, wild embrace in the stock market during which the price of its common stock almost doubled in a month.

Nothing dramatically new or different in Ryan's business actually accounted for the spurt—except the possibility of a stock split.

Though stockholders last week appeared an increase in substantial number of shares, no word of a split came from the board of directors. However, the company did report an increase in earnings for its first quarter—from approximately \$110,000 in 1964-65 to first 92 cents a share for the same period a year ago to \$1.09. Sales rose from \$15 to \$17 million.

Several financial factors contributed to the rise, but the corner of the situation probably was the sharp downturn of its is in the aircraft community rather than anything Ryan did to attract attention.

Last, last year the wind began to blow around in some, an interest began to watch Ryan. The Wall Street gossip column the magnification of Ryan credit this year with two successive companies for a long term loss of \$4 million added fuel to the fire.

The Feb. 9 Ryan share were selling on the American Stock Exchange for \$14 a share, not out of line with the 1958 price range of \$12-15. Ryan's all time high was \$18 in 1971. Its last week the price had hit \$15.50 before selling off slightly.

Wall Street village word for the new—electronics—placed a major role Ryan has just received a \$20 million letter contract from the Navy for an electronics war Doppler APN-322 ground speed drift angle system and a low altitude off program in the field.

Ryan is optimistic in this phase of its business, pointing out that the Navy is going the continuous wave Doppler route rather than the pulse Doppler route followed by USFV and that Ryan could be in a good position to benefit, because of extensive work in this field.

Over interest was shown in Wall Street, the figure in Ryan's 1955 form report was translated into price boost for the future. Based on \$18.50 share raised following a stock dividend at year end, Ryan earned \$4.75 a share as income of 90 cents over 1957. Earnings of earnings of \$1 or \$1.50 a share this year followed. Ryan's price volume, \$75 million last year, would be half tomorrow in a year or two the re-

ports went.

New contracts were rumored to be in the wind.

Two hard financial facts, however, did have a bearing.

Small floating supply of Ryan's stock. Of the 515,357 outstanding shares, 171% are held either by the Ryan family or the Inter group a small or generation of Los Angeles investors. Assuming other large blocs are held by

others on a more or less permanent basis, the number of shares available for daily trading on the exchange is relatively small. Such situation often drives prices up sharply, as in the case of Lufkin Steel in the 1960s, but in the last two years.

The 1,000,000 additional shares of stock authorized last week by Ryan stockholders, give rise to the stock split prediction. As one financial analyst put it, Ryan has been most successful with dividends in the past. Now it looks like they are going to make up for it.

One reason given for a split would



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How Titanium licks the weight bogey in components... A STUDY IN MACHINING SUCCESS

Today's aircraft component manufacturers are getting squeezed from two directions: Weight allowances of complex parts are being drastically reduced... but redesign costs to shave off a few ounces of excess "fat" cannot be written off in the short-run orders of the current market.

What can the manufacturer do? Should he trade profit for good will, or should he simply give up, and yield his position in a market with such excellent potential?

Titanium Metals Corporation of America has found increasing case-history evidence that an economically sound compromise exists: Substitution of titanium for heavier materials, on a volume basis. The results: a lighter assembly; elimination of redesign costs; and no extensive equipment purchase or modification.

Best news of all, the finished product can be workshopped competitively. Here's the proof:

There's an old chestnut, held over from several years ago, that titanium is next to impossible to machine. This belief goes back to the time when fabricating techniques for this new material were still being developed. Today, though, the picture has changed.

"...prefer machining titanium to... stainless steel..."

Cadillac Gage Company, Warren, Michigan, has substituted Ti-3Al titanium for a high nickel alloy in valve housings designed for North American Aviation's AJJ Navy attack aircraft.

Titanium combines the properties that ordinarily require a series of materials. Lightweight titanium is non-magnetic, corrosion resistant and retains its great strength from -300°F to +1000°F. What does titanium mean to Cadillac Gage in production of valve housings?

Weight saving: 3½ lb. Size of contract: \$200,000. Project Engineer Robert McElroy states: "Our shop personnel actually prefer machining titanium to some grades of stainless steel. And the use of titanium has added no more than 5% to 10% to the final cost of the valve."

"...ease in machining... competitive with plastics..."

Fuecher Machine Company, Philadelphia, Pennsylvania, machines titanium on conventional equipment. Valve tolerances to 0.0002" on ½-inch turbine wheel I.D.'s is standard, has cost less for \$50,000 in titanium parts.

The turbine wheel, which rotates the generator in Philco's 1550-watt Schenck turbine, reaches speeds of 60,000 rpm in a fraction of a second. The application calls for a low density material with great strength and heat resistance. Fuecher employs annealed Ti-6Al-4V (150,000 psi tensile, density 0.161 lb./cu. in.) for the job.

General Manager John Santos says: "Recent price reductions and our ease in machining have resulted in making the prices of our turbine wheels competitive with machined plastic wheels. There is, of course, a price difference — but that's more than offset by titanium's vastly superior performance."

"... titanium helps hold rotor weight to 20 pounds..."

General Electric Company, Lynn, Massachusetts, has introduced a new concept in electrical power generation which combines the generator and turbine into a single self-cooling unit. It's called the Turbogenerator.

Turbine and rotor — both on a common shaft — operate at 36,000 rpm. Titanium substituted for steel in top stator and retaining rings enables GE to hold rotor weight to 20 pounds, and achieve efficient turbine speeds, because non-magnetic titanium can withstand high centrifugal forces.

John W. Harman, project engineer, reports: "The Turbogenerator cuts package size 50%, and cost 20% from conventional turbine generator systems. It's versatile and can be used anywhere there's a jet engine."

These findings highlight two things: the growing concern of aerospace makers over weight of purchased parts; the feasibility of contracting with titanium, instead of redesigning to combat excess weight.

The key to effective use of titanium lies in decreasing exposure time relative to machining.

For example, titanium has a low work hardening rate, low coefficient of friction, less shearing force and freedom from notch sensitivity — all contributing to its relatively good machinability.

Commercially pure grades (Ti 99.9, Ti 99.8, Ti 99.5) in general, machine similar to the 300 series of stainless steel. Alloy grades (Ti-6Al-4V, Ti-7Al-4Nb, Ti-55Al, Ti-5Al-2.5Sn) are similar to the 400 series.

Use of sharp tools (replaced at first signs of wear), high feeds, slow speeds, and liberal amounts of coolant enable fabricators to achieve economical production runs.

Titanium Metals Corporation of America is always ready to help you take full advantage of titanium's excellent combination of design properties, by providing a steady flow of information on fabricating techniques,

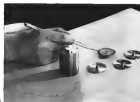
and maintaining a referral program by which prime contractors may locate component manufacturers of demonstrated ability.

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Missile Systems Funds: Fiscal 1946-1960

Outlays for missile programs will drop by about \$400 million in Fiscal 1960 before the Fiscal 1959 level, from \$7.2 billion to \$6.1 billion, according to figures released by the Defense Department. The major decline, \$150 million, will be in ballistic missile programs—from \$2.96 billion in Fiscal 1959 to \$2.71 billion in Fiscal 1960.

Following are the details in millions of dollars. Figures include all procurement, construction and research and development programs directly associated with Defense Department missile programs. They do not include military pay, operations and maintenance costs for operational missile units and other.

Fiscal Year	ICBM/ICBM Programs	Balloons-Surface Missiles	All Other Missile Programs	Total
1946 (and prior)	0	19	51	70
1947	0	26	58	84
1948	0	56	49	105
1949	0	41	51	92
1950	0	65	66	131
1951	145	145	99	299
1952	18	129	411	568
1953	3	401	566	970
1954	14	356	717	1087
1955	161	346	513	1420
1956	116	307	540	1263
1957	196	261	541	1498
1958	277	279	519	1575
1959	296	226	520	1542
1960	274	187	494	1355

* \$2.1 million was programmed during the period for the Atlas AEC/74 ballistic missile program, predecessor of the Atlas ICBM.

be to increase the number of Ryan stockholders, now about 1,000, to the 1,500 required for listing on the New York Stock Exchange. Ryan has 1,000,000 shares authorized, with only half issued. The new authorized total is 2,000,000.

Consequently, Ryan could sell shares outright rather than voting a right, but investment bankers thought this unlikely.

Ryan and a group of investors had sponsored on the West Coast with the stock price run-up that showed Ryan was leaving the company. Though obviously gratified by the rapid appreciation in the company's stock, Ryan officials said they knew of no reason for it beyond their already disclosed.

Based as it was, the Ryan offering was viewed better. Though clearing for example, rose from a low of 15 to just after a stock split to a high of 120 cents.

Investors Respond To KLM Debentures

New York-KLM Royal Dutch-Alcoa Inc. said a bond issue is a viable alternative to its sale of \$15, 400,000 in convertible debentures to finance its part 549 million in additional jet orders—either for more Douglas DC-8s or for Boeing 707s or Convair 440s.

KLM has eight DC-8s now on order and the use of the program indicates it is right now expects would be bought. Twelve Lockheed L-1049 and ten Fairchild F-27s are on order in a total \$57 million program.

A revolving credit agreement with the First National City Bank of New York, the Chase Manhattan Bank of New York and the Bank of America National Trust and Savings Assn. has been renewed by \$70 million—from \$50 million to \$70 million—to give KLM the remainder of the \$17 million in credit extension for the new order. National cash sources are expected to provide the balance.

KLM is the second foreign airline to obtain additional U.S. financing through its U.S. manufactured jet equipment in the last few weeks. Scandinavian Airlines System obtained a \$13 million commitment from a group of banks led by the First National City and \$16 million from two insurance companies last July to finance its DC-8s, and Convair and Convair 440s but also to return the balance outstanding from an earlier U.S. loan for equipment.

Foreign aircraft have been sold to the U.S. for financing largely because of more limited capital available in Europe, investment men here say.

The market here responded to the KLM sale by backing a \$11 premium on each \$100 of debenture in last day of the

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EQUIPMENT



TRAILER which positions and loads Convair B-58 Hustler pod can carry largest pod now planned for the transport trailer and is self-propelled. Single operator loads the pod, using a 118 lb. control box, which is strapped to his chest.

Flexible Loader Developed for B-58 Pod

By Clegg Lewis

Dallas-General handling system for clearing, handling and loading the various pods which are an integral part of the Convair B-58 weapon system is under development here. In Space Corp. The special ground handling system was ordered for the B-58 when a becoming evident that ordinary loads handling equipment wasn't adequate to do the prime job of positioning and loading required under the new pod concept. Space Corp. is building three prototype systems for evaluation by Convair, a division of General Dynamics Corp.

A key element in the B-58 weapon system concept is the flexibility inherent in the use of a variety of pods with their own systems to perform a variety of missions. The Space Corp. system is flexible enough to handle any of the pods planned for the bomber. It could be adapted to handle an air-launched ballistic missile or a tank weapon developed for use with the B-58.

The ground handling system has three main elements, and they are the job of moving the pod, transporting it to the loading area and loading it on the aircraft. Load completed at these three is the change fixture, a simple set of rails connected by steel rollers and supported on stationary legs.

This storage rack can be used to transport a pod on a railroad flat car, and it is air transportable. It is designed to withstand a 90 lb. wind with the pod on it.

The pair of rails on the storage rack is a key part of the whole system. The rack, the transporter and the loading trailer all have rails of the same type and track width, and any of these pieces of equipment can be mated and their rails clamped together while the pod is in its transfer cradle in a cranked position to the trailer.

Second basic piece of equipment is the transporter trailer. It can be towed by standard military vehicles as in aircraft pods and it can also serve as a carrier for transport by cargo aircraft, rail, truck or ship. The trailer has to be air transportable in the Convair C-124 and Douglas C-119 and it must push a 118-in. rail end, including travel at 20 mph over rough terrain, unpaved roads.

Loading Equipment
The transporter trailer has loading equipment to adjust its rails to match the rails on the storage rack without moving its wheels. It also has an air spring suspension system which with the tires drops out shock loads generated by road travel. Specifications limit all four wheel loads on the pod to 1g. The pod can take 2g vertically.

In operation, the maximum load will be 15,000 lb. and the system must be able to operate in temperatures ranging from minus 65 to 160°.

Basically, the pod is held on the main rail cradle of all three pieces of equipment by a circular chain attached to a transfer rail, which in turn, is attached to the rails. The transfer

cradle is tracked where it meets the rails, and a hand truck arrangement moves it along the rails.

The transfer cradle has an internal track system which permits the clamp holding the pod to move, allowing the pod to rotate in its cradle. One of the transfer cradles holding the pod on the rails allows it to rotate freely, but the other is lockable and prevents and one other tells the pod to lock it in place. When this system is plugged into the loading trailer it handles the rail no longer in the delicate job of working the pod into place.

Third basic element in the system is the positioning and loading trailer. This is the vehicle that moves the pod under the B-58 and moves it into place. It is 105 in. wide and 54 ft. long and can handle any pod up to 6 ft. in diameter. The trailer is designed to carry the largest pod now planned under the requirement a 7 ft. in diameter when the trailer is depressed to its lowest level and the bomber's loading gear elevates it all the way down.

Powered by a hydraulic motor through a chain drive, the loading trailer is self-propelled. Although designed for the positioning and loading job, it can be used for relatively short transport jobs when towed by standard vehicles. System has an over-hydraulic brake for road use. A control lever is with standard knuckle brake for positioning work, and a manual master and motion is used to lock it in place.

Hydraulic system is driven by an electric pump which gives it power from a

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The Cessna U-3A is now an operational duty with the U. S. Air Force. Its speed—the highest speed of any U. S. A. F. light twin transport—and its range and versatility are proving highly valuable in raising administrative mobility.

Cessna designed and built the U-3A for hard work. Power loading, acceleration, and climb characteristics are excellent. Single engine performance is particularly outstanding—for this modern Cessna twin packs more power per pound than any other light twin transport. Operating and maintenance costs are low. Result: the Cessna U-3A makes substantial savings for the U. S. A. F. Cessna Aircraft Co., Wichita, Kansas.



cabin mockup in a pressure tank, maintained at 8,000 ft. pressure altitude, and adding 650 lbs. input. All cabin sensors were located but particular emphasis was placed on oxygen glass, which also experienced acceleration testing of about 25G. Test subjects in the cockpit mockup reported no particular discomfort during the test although cabin air sensors were at approximately 2000.

Air flow rates higher than 50 lb./min. were tested and rejected due to higher noise level and interference with nose idling, wing loading. Final cabin outlet level of 500" was achieved through optimum inlet temperatures of 250° at the 50 lb./min. flow rate.

An attempt at bleed-airing cockpit was made because of some complete absence of sensation in high altitude aircraft cabin causes uncomfortable de-orientation even after short flights. One 210th test subject lost 12 lbs. in 1 hr. period. Winter must be provided each subject to use, and although it contributed to the overall cooling effect, it was concluded to be "too noisy" for inclusion in an aircraft cockpit. Ideally, water could be introduced in the form of fog but similar to your droplets of the required size would be extremely difficult to produce. Problems would then be to provide filters efficient enough to prevent clogging.

Aikawa's job is studying problems of space environment from the engineering standpoint. Close to solving the problems of spacecraft environment may be in recent advances in the art of liquid gas storage.

WHAT'S NEW

Publications Received:

1979 Directory of "Missile Manufacturers"—by defense of "Federal Procurement & Subcontract Data" and "A & D." The Research and Development Weekly-Pub. Federal Procurement Publications, Inc., 16-42 47th Rd., Long Island City 1, N. Y. 11101, 21 vol series \$21.00 per copy.

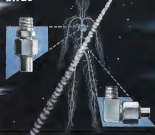
This series lists names and addresses, functions and their addresses, programs, projects, projects, methods and services.

Aircraft Electricity for the Mechanic—by Charles Edward Chapel-Pub. Aero Publishers Inc., 7161 Sunset Blvd., Los Angeles 26, Calif. 90045, 477pp.

Fundamental principles of electricity, electronics, measurement and inspection are contained in this book.

Gliding—by Donk Piggott-Pub. The Merriman Co., 66 Fifth Ave., New

Healthy circulation system for man-made birds



There's quite a healthy... and complex... system of arteries under the skin of an aircraft or a missile. Metal tubing carries fuel to engines... carries orders from instruments to control mechanisms... and carries changes in conditions back to instruments as hydraulic or pneumatic pressure variations.

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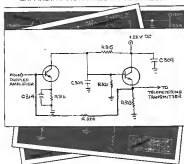
If your project, system, or subsystem uses tubing and you want highest quality fittings from 1/4" to 2" diameter in other self-flaring, barbed, or flared types, write for literature on Fitted Fittings to Dept. AW-359, 207 Blosky Avenue, Inglewood 1, California.



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Achievements in navigation and guidance bring recognition to Maynard engineers

The diagram above, roughed out by a Maynard engineer, represents one of a number of sophisticated steps in the development of a radio-distance measuring set.

As a key member of one of the small project groups at the Raytheon Maynard Laboratory, this man and his associates know what is ahead by recognition. Their accomplishments are a matter of record and they have been rewarded accordingly.

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RAYTHEON MANUFACTURING COMPANY

Government Equipment Division,

P. O. Box 876, Maynard, Massachusetts



Excellence in Electronics

York 31, New York 5508 561pp. Handbook of soaring flight for pupils and instructors

1959 Handbook of Guided Missiles—by editors of "Federal Procurement & Instruments Digest" and "R & D." The Research and Development Weekly-Pub. Federal Procurement Publications Inc., 10-42 47th Rd., Long Island City 1, N. Y. 1 vol series \$15.00 per copy. Missile specifications are given in this issue, including data on missiles, warheads, nose cones, guidance, ground support, propulsion, test and track equipment.

1959 Directory of Government Missile Agencies—by editors of "Federal Pro-



British Altimeter Change

British Air Registration Board is imposing modification of British altimeter altitudes because of susceptibility to misreadings of 10,000 ft. New positions in altitudes above, old display at right. At 55,000 ft. (top) there is no low level warning flag show up in new display, but there is a low level flag of the 10,000 ft. follow-up bar. At 11,000 ft. (middle) on old display the 10,000 ft. pointer lies below the 1,000 ft. pointer. Despite the flag on the 1,000 ft. pointer (not shown) on all altimeters the 90,000 ft. pointer is partly obscured. On new presentation the low level warning flag is showing to become visible. Length of bar follows up bar has decreased. At 1,700 ft. (bottom) a large area of low level warning flag shows on new display. Follow-up bar is almost wholly absent.

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construction & subcontractors Daily and "R & D." The Research and Development Weekly-Pub. Federal Procurement Publications, Inc., 10-42 47th Rd., Long Island City 1, N. Y. 1 vol series \$15.00 per copy.

This series deals with purchasing, advertising, program, research and development, products and materials.

Solution of Problems in Aerodynamics—by S. A. Ury, 98 St. AFRAC 5-45th St., New York 10, N. Y. 56-75, 102pp.

Contains 400 problems selected to give aerodynamic students practice, and also contains examinations of engineering institutions.

At The Pro-Plan by John R. Hight, John R. Hight, Inc., 100 West 42nd Street, New York 36, New York 54-97, 271 pp.

The book outlines how to improve basic flight skills and master the more advanced techniques of flying.

Fundamentals of Radio Telemetry—by Morris Tupper-John, Radio Telemetry, Inc., 116 West 14th Street, New York 11, New York, \$1.95 \$30 pp.

The field of radio telemetry is covered in this book, which explains its purpose and explains its techniques.

Bonded Aircraft Structures—John C. (A. R. L.) Lomax, Dordick, Cambridge, \$7.95 17 pp.

Basic concepts of paper given in Cambridge at a conference arranged by Aero Research Ltd., Dordick, Cambridge, 1957, concerning bonded aircraft structure.



Vanguard Program Timer

Master sequence controller used on Soviet Vanguard satellite launch vehicle employs precision start tape to provide 10 channel set of command for controlling signals for patch angle programming, stage separation, separation, deployment and post-launch for target for industry, Inc., Cleveland device weighs less than 6 lb., measures 11 in. diameter and 11 in. long. Focus time reference is obtained from time-based oscillator which permits accurate time drive output.

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*Patent applied for.



BUSINESS FLYING

Fewer Pest Control Programs Mean Tighter Competition for Sprayers

Landing off last year of big-scale pest control programs—in some cases covering several states—is expected to show, when detailed figures are in, that registered sprayer operations declined compared to the better season of 1997.

Indications are that continued reductions in the big projects will occur in 1999, accounting for a temporary plateau for many spray/chart plane operations this year.

Operations sponsored by U.S. Department of Agriculture remain important class at the overall aviation activity in these fields available data on last year's work and that planned for the current period indicate that its programs will be at 1998 levels or even lower, less in others.

Fight for Business

Fewer contracts will mean heavier competition among operators and probably an increase in the problem of non-paying late cutting as a desperate attempt to cover available business.

Aircraft operating under state and federal cooperative programs, with farmers and ranchers in some cases sharing costs, covered 5 million acres in pest control last year.

Activities included three major projects in the pest control field:

- **Cotton moth operation** in Pennsylvania covered approximately 517,000 acres at a cost of approximately \$6 cents an acre, including materials.

- **Groundskeeper work** in Minnesota, Idaho, Wyoming, Colorado, Texas, Nebraska, Kansas, California, Oklahoma and New Mexico totaled covering approximately 1,757,000 acres at a cost of 10 cents per acre.

- **Mosquito cricket contracts** in Nevada, Utah and Idaho worked over 73,000 acres at a cost of 51¢ an acre.

- **Inspected fire ant** was hit in Texas, Louisiana, Alabama and Georgia for a total of some 400,000 acres at a cost of 51¢ per acre.

- **Japanese beetle** was attacked in 15 states and less over 17,000 acres at a cost of 51¢ an acre.

- **Pack** battalions war hit in Arizona with operations covering 100,000 acres, including treatment.

- **Mediterranean fruit fly** was worked over in Florida where 10,000 acres were handled at a cost of 50 cents an acre. One of the big projects in 1997, this was completed as the first two months of last year.

Groundskeeper, imported fire ant and Japanese beetle programs are expected to be of equal intensity this year. Mosquito cricket program is expected to be



Mexican Bank Gets Fairchild F-27A

Bank of Mexico's new Fairchild F-27A, owned by the Bala-Risco Rito. The turboprop engine, from the manufacturer's Hagerstown, Md., plant on its delivery flight was the fourth F-27 delivered to a foreign customer. Another one is expected delivery was to South Tire & Rubber Corp. before year-end, Boston & Boston, Pa. Work. Tex. is donating the role of Bank of Mexico's engine as well as Washington Electric Corp.'s and Midland Cement's F-27s.

less than in 1998. Some other programs are completed, including a few that were costly efforts last year.

U.S. Forest Service last year spent about spraying of approximately 870,000 acres in various forests, mostly in the Pacific Northwest, some against spruce budworm, and an additional 170,000 acres as state and private lands under cooperative agreements. This year those projects are expected to encompass only about 500,000 acres.

Forest Service continued to make big gains in use of airplanes for fighting fires last year—statistics show that approximately 1,442,000 gal. of fire retardant chemicals were dropped from the air, more than double the previous year. Fixed wing aircraft were flown more than 22,671 hr., with Forest Service aircraft accounting for 4,445 hr. and chartered commercial aircraft for 17,944 hr. Helicopters, mainly operated by private contractors, put in 5,746 hr.

Panhandle Jumps

In its first lighting mission, 308 Forest Service aircraft made 2,713 panhandle jumps. Forest Service aircraft also accounted for covering 75,723 persons, mostly for lighters, and mostly using commercial aircraft. A new technique of purchasing cargo from helicopters accounted for dropping 71,930 lb. out of 714,470 lb. carried by all types of aircraft. Another 770,000 lb. of cargo was hoisted from field to field. Use of helicopter on forest work increased by approximately twice, with three major activities being in the Pacific Northwest, the Forest Service reports.

In addition to special hazards associated with operator's work, and increasing competition another troublesome problem is making the agricultural business leader for them, they are an increasingly heavier attack on ground activities in, more areas who run these aerial operations is detrimental to their interests.

Report presents a being brought to bear by the Audubon Society, American Wildlife Fund. Last year, legislation in two states had bills that, if passed, would have grounded aerial operations in those areas. Opponents report that when they attend hearings in both on pending aerial application legislation, they are greatly outnumbered by representatives of organizations representing nature lovers.

But low and clouds aircraft operators last year was a struggle against the 18th transportation bill that they have been arguing has often means the difference in this being able to compete with ground transportation, only less as against farmers. Department of Interior Bureau, which opposed the record of the cause, argued that the government

Acoustics Engineers

Our recently established acoustics laboratory offers ground floor opportunities to qualified acoustic engineers. Facilities also with experience in measuring and testing high intensity levels, analytical engineers capable of predicting spectrum of noise from various sources, and structural dynamicists able to predict noise effects on machines and aircraft are all needed immediately.

Acoustic Computers—Our RADAC (Research and Development Analog Computer) laboratory has recently been expanded to a 500 amplifier facility. This group has experience for mathematicians and engineers capable of programming and solving problems of machine and structural design arising from all engineering groups. IBM 704 computer available to augment analog equipment.

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ENGINEERS: Write Mr. Des Lauriers for your copy of a paper on "Airborne Early Warning in the Missile Age," presented by Robert A. Bailey, Chief Engineer, California Division, Lockheed Aircraft Corporation, at the 6th USAF World Wide Weapons Meet.

Lockheed

Speed Attempt

Max Jerro Cobb will attempt to set a new world speed record, Category C-1E, over 1,240.7 mi., now held by the USSR. Attempt, to be made during World Congress of Flight, Las Vegas, April 17, will enter a trans-oceanic jet. Commander COBB hopes plan to set the mark established in 1955 by Pete Ziskindson in a Yak-11. Race and attempt will be sanctioned by Federation Aeronautique Internationale for confirmation.

would lose an estimated \$12 million in revenue this year, indicating that air traffic control is causing a total of some \$120 million annually now. National Aviation Trade Assn., which led the battle to have the law lifted, says that this is a conservative estimate.

Reading Air Meeting May Attract 5,000

An estimated maximum of 5,000 visitors are expected to attend Reading Aircon. Schenck's 1964 annual business forum, week-long and open to the public, starting at Reading (Ph) Municipal Airport. Plans are being made to handle up to 750 visiting aircraft during the two-day meeting, June 5-6.

The meeting, which features sessions detailing new techniques and products for the business pilot, also provides flight demonstrations of latest aircraft types. Several of the new turbo-propelled executive transports are expected to participate this year.

Propaganda and trophies will also be awarded to company-operated airplanes in four classifications and categories. Award this year will be on aircraft providing a maximum payload and high performance. The annual show is not open to the public and attendance is by invitation from Reading Aircon.

Civil Agency Fleet To Total 414 Planes

A total of 414 aircraft will be operated by various civil agencies of the U. S. government during fiscal 1966 and expenditures for acquiring and maintenance costs are expected to be \$10,144,990.

The government agency fleet will include 31 new aircraft purchased at a cost of \$12,795,060. Major aircraft users are:

- Federal Aviation Agency, which will operate 117 aircraft during the 1965 fiscal year, including three transport airplanes used for checking and testing air navigation facilities. FAA's aircraft are also used for developing flight

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with standards, operations, training and flight proficiency and integrate many part of its stations in the Pacific and to Alaska.

• Department of Interior, operating 70 aircraft in seven agencies, including Helicopters and Jet planes line patrol for the Roosevelt River Administration in one aircraft and in the Everglades National Park to detect poachers and act in search and rescue missions.

• Immigration and Naturalization Service, which will operate 31 aircraft to prevent illegal entry into the U. S., also for deportation of aliens. Forest Service of the Dept. of Agriculture will use 33 aircraft to transport fire fighting personnel and handling post and tree debris.

PRIVATE LINES

Emergency fuel centering system for Lockheed Lodestar and Learjet extra jets transports by Pacific Engineering Corp. is designed to eliminate engine power failure due to more common forms of carburetor icing. On sign of carburetor ice, pilot activates the Pan-Aero system providing an alternate source of fuel pressure, bypassing the carburetor to achieve control and providing manually controlled mixture, carburetor, manifold pressure and flow meter readings to achieve desired power. Complete kit, including overhaul and modified carburetor is priced at \$495 for a P-1012-14 induction, \$515 for a P-1012-1C10. Installation of Pan-Aero costs \$150 for Lodestar, \$725 for Learjet.

Price of 1999 Lozmore, 5th in two-place personal plane is \$4,200. Brown factory F1 Collins. Gold Series of the 90-lb. Continental powered Model 8F during the first two months of this year are expected to be better than demand. Silver Aircraft Inc., is currently developing a distributor and dealer organization.

Business and private pilots are invited to visit the facilities of Tullahoma Aviation Agency's National Aviation Facilities Experimental Center at Tullahoma City, N. J., on the weekend of May 9. FAA will discuss plans and programs for modernization of U. S. aviation facilities. Arrangements for the tour are being directed by Robert Swales, FAA Bureau of Research and Development general aviation research unit.

Flight school course aimed at the businessman has been started by South west American Corp. working with Del Tin Aviation, the former hand flying ground school and the latter flight training. Operation marks Southwest American's entry into flight training.

Avionics Engineers

New projects at the Columbus Division have created openings for electronic engineers and scientists in many fields.

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WHO'S WHERE

(Continued from page 13)

Changes

Dr. Vincent J. Chaboy, a veteran aircraft engineer, has been named as the new United Aircraft Corp. East Hartford, Conn.

James A. Casady, head advanced engine planning, Electronics Division, United Aircraft Corp., Hartford, Conn.

Joseph R. King, chief mechanical engineering, United Aircraft Corp., Hartford, Conn.

Norman V. Johnson, chief mechanical engineering, United Aircraft Corp., Hartford, Conn.

Lockheed Aircraft Corp.'s Georgia Division, Marietta, Ga., has established a new division to support a package program of the B-70 Valkyrie reconnaissance bomber and made the following appointments: J. A. Jager, manager, and D. H. S. Smith, assistant manager.

The Georgia Division also announced: R. D. Gilroy, Chief Engineer, and J. W. Cowie and J. W. Plase, assistant project engineers.

David V. Cox, chief engineer, B-70, is reported to have been named as the new Chief Engineer of the B-70.

R. H. Johnson, Chief Engineer, Santa Ana, Calif., has announced the following appointments: Robert G. Ayres, general engineering manager; Terry B. Barbee, advertising and sales promotion; F. G. Vah, chief of records; James M. Miller, contract sales manager at Washington, D. C.

Walter J. Albrecht, chief engineer, Sperry-Kennedy Laboratories Inc., Boston, has been named as the new Chief Engineer of the Sperry-Kennedy Laboratories Inc., Boston.

John W. Hammond, assistant director of engineering, Ford Instrument Division of Sperry-Kennedy Laboratories Inc., Boston, has been named as the new Chief Engineer of the Ford Instrument Division of Sperry-Kennedy Laboratories Inc., Boston.

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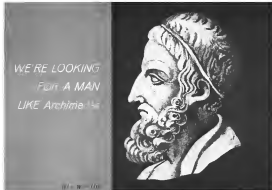
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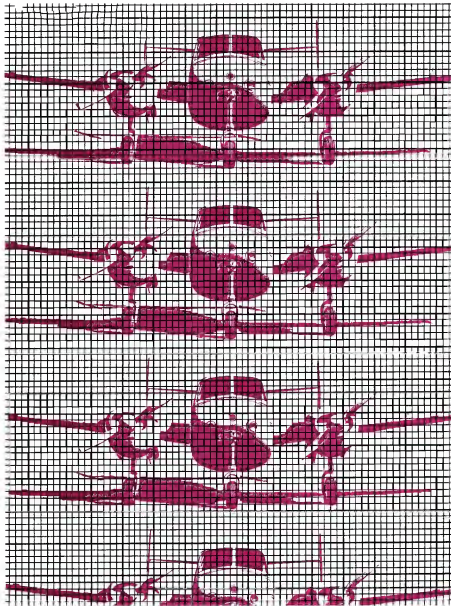
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